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ESMT Working Paper

THE DISTRIBUTION OF PARTNERSHIPS BENEFITS

EVIDENCE FROM CO-AUTHORSHIPS IN ECONOMICS JOURNALS

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Abstract

The distribution of partnerships benefits: Evidence from co-authorships in economics journals⁺

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Partnerships can be found in many areas of social and economic life. These arrangements have become particularly common in research and development activities where organizations increasingly look for partners to complement their own technological capabilities with a view to create innovative products and processes. R&D partnerships, however, are fraught with challenges because the conditions for creativity through cooperation are still not fully understood. Academic partnerships are also very common and offer a fertile ground for investigation. Academic cooperation takes many different forms and results in a wide range of outcomes (Laband and Tollison, 2000). One of the most visible outcomes is co-authored publications (Melin and Persson, 1996). Nowadays, there is extensive data available about both the context of these partnerships as well as the quality of their outcome. This paper explores the determinants of the gain for authors who cooperate through co-authorship in the publication of academic articles. We distinguish between short-term benefits (i.e. the increase in citations of the co-authored article relative to the authors' previous publications) and the long-term ones (i.e. the increase in citations of articles subsequent to the co-authored piece). We find evidence that these benefits have different determinants for co-authors depending on their past experience. While co-authorship generally seems to benefit more the junior (younger and with a lower academic reputation) author, the senior partner can reduce the gap with a strong personal track record and co-authoring experience.

Keywords: co-authorship, academic partnership, joint research, joint publication, asymmetric authorship, benefits sharing

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1. Introduction

Partnerships can be found in all sectors of economic and social life: in business, in arts, in science, in politics, etc. They have also become prominent in research, be it industrial or academic (Wuchty et al., 2007). They come in various forms of collaboration (Laband and Tollison, 2000), such as joint research projects, scientific discussions, and many others that are less formal. They have grown substantially over the past few decades in all fields of published research, especially in the last part of the 20th century (Glänzel and Schubert, 2005, Wuchty et al., 2007, Lemarchand, 2012). This trend touches most disciplines and can also be observed in management and organizational studies (Acedo et al., 2006), accounting (Fleischman and Schuele, 2009), and finance (Chung et al., 2009). McDowell and Melvin (1983) find evidence of a similar trend in economics, and they predict a continuous expansion of this phenomenon. According to Laband and Tollison (2000), the proportion of co-authored articles in economics grew from less than 20% in the 1960s, to over 60% in the 1990s.

Several drivers have been identified as playing a role in this sustained growth. They include increasing specialization (McDowell and Melvin, 1993), the search for efficiency (Katz and Martin, 1997), proximity (Mairesse and Turner, 2005) but also “preferential attachment”, i.e. “the self-interest of researchers to link together in search of rewards, reputation and resource offered by a collaborative network” (Wagner and Leydesdorff, 2005). There is abundant literature on this question.

Many aspects of co-authorships have been investigated, including the reasons why it has been developing so significantly over the past 50 years, as well as the costs and benefits of co-authorships (e.g. Hollis, 1996, 2001). Yet much less is known about the effect of asymmetry between co-authors on the benefits that accrue to each “partner” of an article.

Asymmetry is defined as the difference between co-authors regarding research experience, influence, and reputation. It is rather frequent in academic publication and has been advocated as an effective approach for junior colleagues to acquire skills, competence and experience (Reed et al. 2002). Therefore, it would be valuable to develop a better understanding of the factors affecting the benefits obtained by asymmetric co-authors from their cooperation. This article provides evidence about this question. We investigate the drivers and benefits of co-authorship in economics, given that collaboration in this discipline presents certain characteristics (e.g. the high proportion of “duos”), which makes a statistical analysis particularly meaningful.

Our paper is structured as follows: In the next section, we provide an overview of the literature on co-authorship, highlighting the key findings in this research domain, as well as some pending questions. In section 3, we present our research question and the theoretical background to our investigation. Our model and hypotheses are presented in section 4. The fifth section is devoted to presenting our data collection and the statistical analysis techniques we used. Finally, in section 6, we discuss the results and elaborate on what we consider the key implications of our research and future investigation.

2. Cooperation and partners' benefits: the case of academic research

Cooperation between academics and researchers is not new; it has been a tradition for decades, but has now become the dominant mode of “production” such that individual research is becoming the exception in most disciplines. In this section, we define co-authorship as one form of academic cooperation. We discuss the reasons why it has become so frequent, the methods to measure its output, and the benefits and costs that it entails for the co-authors.

2.1. Defining intellectual collaboration and co-authorship

Academic collaboration materializes into a broad range of artifacts such as co-publications, joint presentations of research papers at conferences, research seminars, working papers, research reports, and many more. Co-authorship of scientific articles, however, is one of the most convenient activities to measure the outcome of collaboration because there is a definite “output” (i.e. a publication) whose “quality” can be assessed by various methods. Yet, co-authorship does not always reflect actual collaboration (Melin and Persson, 1996), especially when it comes to publications with many authors, as is the case in certain disciplines. On the one hand, the real number of co-authors may be higher than the number declared, if the lead writers omit some contributions that they consider marginal (Glänzel and Schubert, 2005). On the other hand, there can be fewer effective contributors to an article if the name of a particular person is included to acknowledge some kind of support (financial, political or other otherwise), as is sometimes the case in large research organizations. Another bias comes in the form of “abusive” authorship when a senior academic imposes his/her name on a junior colleague (Kwok, 2005). Mistreatment of this sort has been reported in natural sciences and medicine, but not much in economics, which is the field of research under consideration in this article. According to Kwok (2005) it is typical of mediocre scholars who “need to publish”, and especially scholars whose scientific output may not be sufficient to deserve professional advantages, in terms of contract extension or salary increases.

In theory, there can be an unlimited number of authors to a co-published article. In certain fields of research, it is not rare to find six different names and more attached to a paper due to certain traditions to mention as authors persons whose contribution has been relatively peripheral. There are considerable differences between disciplines regarding the frequency of co-authorship and the average number of co-authors, even among social sciences and humanities (Ossenblock et al. 2012). This makes the study of co-authorship in particularly

difficult, as data must be collected on a large number of co-authors. Other disciplines, however, have experienced a relatively high level of one-on-one co-authorship. This is particularly the case in economics where these “duo” authorships reportedly represent close to 50% (Sutter and Kocher, 2004), probably reducing the likelihood of abuse than when there is a large number of co-authors.

2.2. The drivers of co-authorship

Several factors have been credited to leading economics scholars in co-authoring their research articles. Three drivers were initially considered to play a special role in economics research. Not surprisingly – because this investigation was conducted by economists – these drivers are based on classical economic theory (Piette and Ross, 1992). A first factor is the increasing specialization of economists due to the expansion of their fields and the necessary division of labor that is expected to drive efficiency as it does in industrial activities. A second driver is the opportunity-cost-of-time of researchers: researchers’ time, in economics and elsewhere, is scarce, and consequently they need some return to have an incentive to spend time on other colleagues’ research projects. Thirdly, researchers face the risk of their submission being rejected by academic journal editors, which leads them to adopt the typical response to risk - diversification. Piette and Ross (1992) find evidence of the specialization argument as well as the need to publish. Hudson (1996) adds two more reasons leading to academic collaboration in economics: “the increasingly technical nature of the discipline; (...) and the growth in the size of the profession from which suitable collaborators can be found”. Finally, an important driver of co-authorship is the increasing importance of transdisciplinary research, the so-called concept of “Mode 2” research, introduced by Gibbons et al. (1994), an intuition that finds supporting evidence from recent bibliometrics research (Martin, 2011). McDowell and Melvin (1983) provide empirical evidence that co-authorship is more frequent for areas of specialization in which knowledge depreciates faster

and in areas where there is a greater number of economists working. Other empirical researchers find evidence for other drivers of co-authorship in a variety of disciplines: the search for efficiency (Katz and Martin, 1997), proximity (Mairesse and Turner, 2005), but also “preferential attachment”, i.e. “the self-interest of researchers to link together in search of rewards, reputation and resource offered by a collaborative network” (Wagner and Leydesdorff, 2005).

2.3. Assessing the “value” of an academic article

The “quality” of an academic article is typically assessed on the basis of the number of citations that it receives in subsequent publications, sometimes weighted by the impact factor of the journal in which the article is published. This approach has a long history. It has been used, and is still extensively used (Simonton, 1988, 2008; Azoulay et al., 2010; Azoulay et al., 2011; Jones, 2010) as a measure of an article’s “creativity”. Yet, there are well-known methodological biases (Strumpf, 1995), because the number of citations is influenced by several factors such as the journal’s reputation, the language, the topic (methodological contribution vs. literature review, theoretical vs. empirical approach), and the authors’ productivity (prolific scholars are quoted more often). Quantity can be associated with perceived quality since the “distinguishing characteristic of a genius, scientific or otherwise, is immense productivity” (Simonton, 1988, cited by Strumpf, 1995). In this respect, Strumpf (1995) writes: “Despite their limitations, citation counts have become very popular and will certainly continue to be an important tool to evaluate the scientific impact of publications and scientists”.

Citations in journals therefore have been considered as the *reward* of authors for their scientific production. Laband and Pietter (1994) consider citations as the *remuneration* of authors: “Our position is that citations are the scientific community’s version of dollar

voting by consumers for goods and services.” Hilmer and Hilmer (2005) bring tangible support to this concept when they find that journal quality affects economists’ salaries, even in co-authored papers, although less than for single-authored papers, but independent of the authors’ order (i.e. there is no wage premium for being the lead author of a non-alphabetic list). They also find that citation counts are widely used as an incentive and enter into decisions regarding recruitment, promotion and remuneration of research personnel. In the same vein, Chung et al. (2009) express the same position: “It is also reflective of a market measure of quality as the entire academic community can decide whether or not a paper is worth citing”. This would explain why authors “seek to maximize their ‘score’ on one or more bibliometrics indicators” (Martin, 2011).

There is an on-going debate regarding the assessment of co-authored papers. Some researchers, like Hudson (1996), suggest a discount proportional to the number of co-authors. Sauer (1996) finds evidence of positive individual returns on co-authored papers and estimates, based on salary evolution, that an individual return from a co-authored paper is approximately $1/n$ that of a single-authored paper, where n is the number of co-authors. Yet, Bruno (2010) demonstrates that the evaluation of co-authored papers should depend on what the university (the employer) expects from its staff: either maximum effort from all researchers, or the identification of the best scholars. The $1/n$ rule is effective for the former objective, but not for the latter. Whether or not this rule finds acceptance, it should not affect considerably the attractiveness of co-authorship because its benefits are not purely financial.

2.4. The benefits and costs of co-authorship

2.4.1. Does co-authorship bring benefits, individually and socially?

At the individual level, the issue is whether or not collaboration leads to “better” publications, typically assessed in terms of the number of citations received. Clearly, there is no broad agreement on this question. Wuchty et al. (2007) find that teams produce publications that are more highly cited than those of individual scholars. Avkiran (1997) finds that co-authored papers in finance are not significantly better rated than single-authored ones. Hollis (2001), on the other hand, finds that co-authored papers tend to be more easily accepted and receive more citations, so that it could be argued that co-authorship leads to better publications. The same author stresses however that if “the publications are discounted by the number of authors, the relationship between research output and teamwork becomes negative”. Medoff (2003) empirically tests whether or not researchers who collaborate “produce higher quality research than those of sole-authors”, and concludes that there is no significant increase in quality measured by citations. Sutter and Kocher (2004) find that the vast majority of economic departments at US universities produce mostly (more than 50%) co-authored papers and that the number of articles placed in top journals is strongly associated with the quality of the co-authors’ institution. Chung et al. (2009) conclude that co-authored papers are cited more frequently and that teaming up with a prolific author seems to pay off. However, the same article reports that co-authoring with someone from the same institution leads neither to higher nor lower quality papers. Additionally, the link between co-authorship and quality disappears as regards theory papers, compared with papers with an empirical content.

At the social level, there is also the issue of research productivity, i.e. “quantity”. Katz and Martin (1997) show that collaboration is seen as a means to increase productivity, a point also made by Hudson (1996), but its cost is not sufficiently known. Fafchamps et al. (2006) find that scientific collaboration moves ahead faster when co-authors are more closely connected (network effect), echoing the findings of Mairesse and Turner (2005). Ductor

(2010) observes that several studies find a negative relationship between co-authorship and productivity but claims that this conclusion suffers from a methodological bias given the difference between authors in terms of their likelihood to collaborate. He finds that once these differences, and other biases, are accounted for, the effect of intellectual collaboration on individual productivity is positive.

2.4.2. How costly is co-authorship?

The choice of collaboration in general and co-authorship in particular has been analyzed by economists in terms of a cost-benefit analysis. Hudson (1996) highlights many drawbacks such as the loss of quality that results from compromises negotiated by co-authors leading to smaller “imagination leaps”, the cost of coordination, and the social cost of having two scholars busy with a single scientific contribution. The latter effect is observed by Hollis (2001). A particular form of social cost would be the presence of free riding behavior, whereby one co-author would not really contribute to the production of the published piece but still be acknowledged as an author (Kwok, 2005). The cost of academic collaboration can also be interpreted in terms of group decision-making theory in the sense that large teams suffer from diseconomies of scale. In other words, teams are more efficient than individuals in accomplishing certain tasks, but as teams get larger there are more disadvantages than advantages so that productivity diminishes (Hackman, 1990; Steiner 1972). Groupthink and group polarization are two of the most documented mechanisms that may lead a group to make sub-optimal decisions. Ductor (2011) spots another form of cost linked to the time lost in the coordination of different authors’ diaries, which he calls “congestion externality”. Chung et al. (2009), however, do not find supporting evidence for this hypothesis. Instead, they find that papers with more co-authors generally get cited more often, except for theoretical papers or for papers co-authored by researchers from the same institution.

Considering the continuous growth of co-authorship, it would seem reasonable to expect that costs are lower than benefits, or at least that scholars engaging in co-authorship projects expect them to be that way. Research findings so far are still somewhat contradictory, even assuming that the academic partners have the same (symmetric) skills endowment (competences, experience, reputation, etc.), but what happens when these endowments are asymmetric, meaning that one of the publication partners has higher qualification?

2.5. Symmetric vs. asymmetric partnerships

The arguments developed in literature on co-authorship generally do not consider explicitly the situations of asymmetry between the academic partners. Yet, co-authorship between authors of different reputation, seniority, experience, etc. is quite common in most disciplines, including economics. When considering experience as a proxy for qualification, there are often differences – sometimes substantial ones – between co-authors. For instance, numerous articles are published by pairs composed of a PhD student and his/her doctoral supervisor, or a post-doc researcher and his/her former supervisor, or an assistant professor and a full professor, etc. Even co-authorship between two colleagues at the same level of reputation is unlikely to be perfectly symmetric. Assuming reputation is measured by accumulated citations over a certain period of time or by the ranking that is computed in some disciplines (e.g. the REPEC ranking in economics), there is actually a very small chance of observing a perfect symmetry between two co-authors.

As a consequence of these considerations, the question of benefit sharing between co-author arises: who benefits the most and what drives the gains in asymmetric co-authorships?

Academic researchers have not yet paid much attention to the distribution of benefits accruing to individual researchers/scholars involved in co-authorship research collaboration and specifically to the balance of benefits between co-authors. Looking at a related issue,

Azoulay et al. (2010) find that co-authors working with “superstar” scholars are negatively affected by the sudden death of these outstanding scholars with whom they publish and suffer a lasting 5% to 8% “decline in their quality-adjusted publications”. Yet, the relevance of these findings is limited to co-authorships with such “superstars” and needs to be investigated on a broader scope. This is what we attempt to do in the next section of this article.

3. Co-authorship as a “partnership”

3.1. Asymmetric business alliances

Asymmetry has been investigated extensively in the field of strategic alliances. Research in this field offers a wealth of theoretical approaches and methodologies that can be adapted to address our research question.

Asymmetric alliances are especially chosen to access new competences (Kalaigianam, 2007). They are relatively common in R&D collaboration (Neil et al., 2001) and present significant management challenges (Minshall et al., 2010). However, research on the distribution of benefits between asymmetric alliance partners, measured in terms of shareholder value, has not reached a consensus. While some researchers find that larger firms gain more shareholder value from the collaboration (Alvarez & Barney, 2001), others conclude that there are equivalent shareholder gains for the large and the small partner (Chan et al. 1997; McConnell and Nantell, 1985; Kalaigianam et al., 2007), and yet a third set of researchers notes that the smaller partners enjoy higher shareholder value increase than their larger partners (Das et al., 1998; Koh and Venkatraman, 1991). The research of Kalaigianam et al. (2007) is particularly interesting because the authors take a different approach and look at the drivers of gain distribution between partners involved in asymmetric alliances aiming at new product development. They find that the asymmetry of

gains depends on several characteristics regarding the firm, the partner and the alliance itself. However, they also note that the complexity typical of strategic alliances with respect to the terms and conditions, the value and the amount of resource contribution, somewhat limit the relevance of their findings (Kalaignaman et al., 2007).

The aforementioned research draws on a variety of theoretical frameworks: transaction cost theory, game theory, resource-based view, social network, the theory of trust, and many others (see Child, 2005). These frameworks are generally applied to “inter-organizational” partnerships, which arguably can differ from collaboration between individuals (Zaheer et al. 1995). Co-authored publications, however, can hardly be considered as strictly inter-personal partnerships. Academic scholars work in the context of organizations (a research lab or a university department) from which they obtain resources and support in the way of technical, scientific, or administrative competence. Furthermore, the quality and quantity of their publications also represent “remuneration” for their supporting organization. In that sense, co-authorship can be analyzed, with some caution, using some of these frameworks.

3.2. Theories of business cooperation

Two fields of research seem particularly relevant for our research question: the resource-based view (RBV) of the firm (Penrose, 1959, Barney, 1991, Das and Teng, 2001) and the theory of relational assets (Zaheer et al. 1995, Gulati, 2007; Arino et al., 2001). The RBV of strategic alliances “suggests that the rationale of alliance is the value-creation potential of firm resources that are pooled together” (Das and Teng, 2001). Hence, alliances are formed not simply to access new resources but also to better exploit one’s own resources.

Carayannopoulos et al. (2010) use a knowledge-based view (KBV) of the firm to show that alliances (as opposed to acquisitions) are a chosen mode of access to external knowledge when knowledge is highly specific and when the firm has prior experience in alliances. This

research suggests that the success of an alliance depends on the adequate quality of resources owned by partners.

The theory of network resources (Gulati, 2007) proposes that organizations looking for partners choose them based on information regarding both the value of their resources and their relational capabilities. The theories of relational governance (Zaheer et al. 1995) and relational quality (Arino et al., 2001; Van de Ven and Ring, 1992) offers a complementary view: organizations prefer to partner with firms with whom the quality of relation will be good because it makes the alliance run efficiently and effectively. These theories therefore insist on the importance of relational assets between partners.

4. Model design and hypotheses formulation

4.1. Background of the research model

Our research model is designed to understand the factors driving the benefits of co-authorship and their distribution between two co-authors endowed with asymmetric resources. Consistent with the two theoretical approaches of business cooperation mentioned earlier (resource-based view and relational assets), we consider that authorship benefits are driven both by the quality of the resources (e.g. the access to research competencies) of the co-authors, and by their relational assets (e.g. quality of cooperation) (see Figure 1).

Although there is some evidence that opportunistic behavior can occur in academic cooperation (Bruno, 2011), we do not mobilize the transaction cost theory in our model. Abusive co-authorship is spotted in situations characterized by high asymmetry between authors (senior-junior), and where the senior co-author seeks visibility (Kwok, 2005). We construct our sample in such a way that it does not include the second condition, by

selecting the senior authors in the list of the top 1000 economists in the REPEC publication ranking.

Figure 1: Two antecedents of benefits from co-authorship



The benefit of academic collaboration can be quite varied, too (output, increased reputation, learning, know-how, networking, etc.). Yet, given the explicit – if not exclusive – attention paid to output and reputation by academic employers, and their use of citation measures to assess their staff, we decide to define benefits in two ways: return and learning. The first type of benefit – return – can be measured by the increased exposure gained from publishing with a reputed co-author. We call this the short-term effect of co-authoring. The second type of benefit – learning – can be assessed with the visibility gained with articles published subsequently to the co-authored one. This is the long-term effect. In both cases, the benefit is measured by the increase of visibility (number of citations) relative to the past. The short-term benefit is therefore the difference between the number of citations obtained in the focus article and the average number of citations prior to it. The long-term benefit is calculated as the difference between the average number of citations in articles subsequent to the focus

article and the average number of citations prior to it. The former can be associated to “tie formation” while the latter are typical of “tie persistence” (Dahlander and McFarland, 2012).

For practical reasons, we select articles published exclusively by two co-authors. It is easier to assess the impact of co-authorship under these conditions than in publications of multiple authors. This is why we chose the field of economics where “duo” authorship is the most common configuration (Hollis, 2001), even relative to sole authored papers. One of the two authors we call the “focus” author: this is the author we choose through a random process as explained in the section on data collection. The other author, who is selected from the focus author’s co-authors (as also described in the data collection section), we simply call the “co-author”.

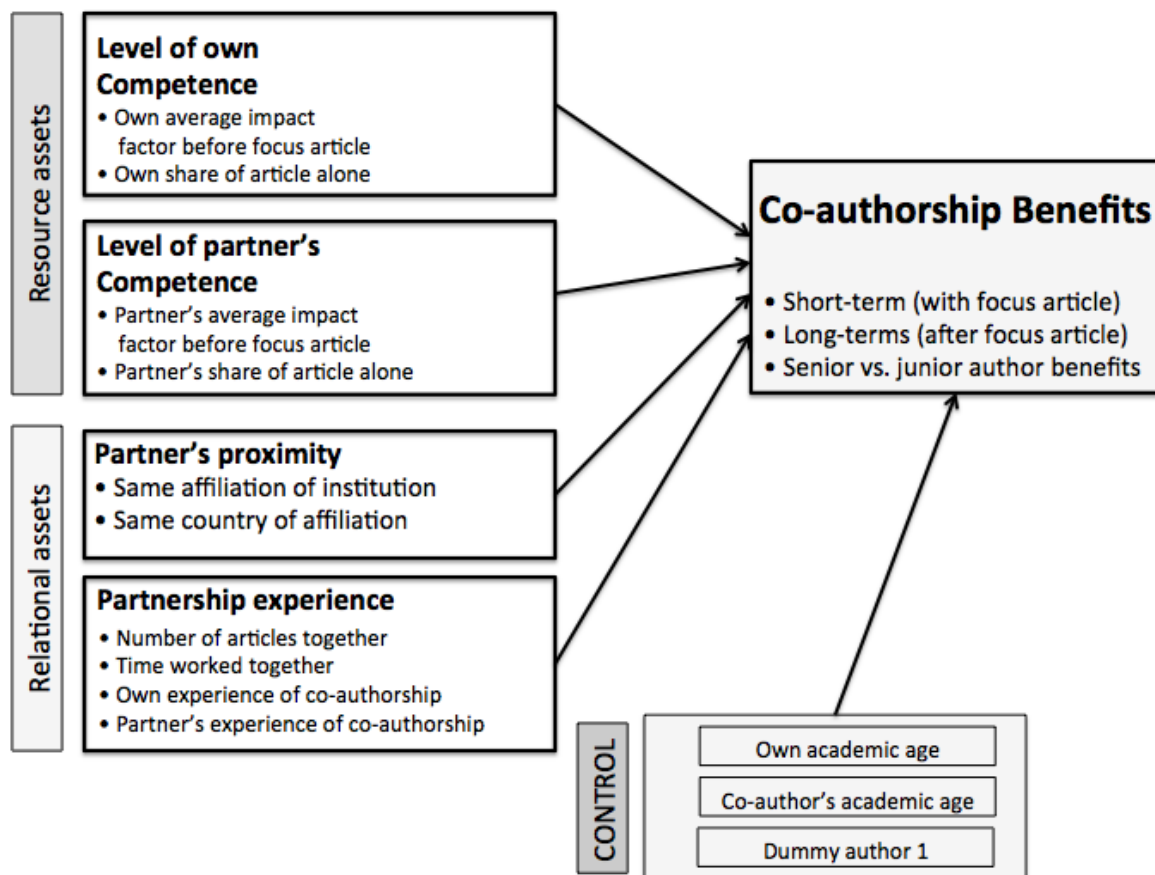
4.2. Research Model

In our model (Figure 2), the benefit of co-authorship for a given author is assumed to depend on the available competences (both her/his own and the co-author’s) and on the expected quality of relationship with the publishing partner. Put differently, in our empirical model, we investigate how available competence and expected quality of relationship with the publishing partner (the different explanatory variables described in the next paragraphs) determine the benefit of co-authorship (the dependent variable). We evaluate this relationship by means of a regression analysis, which has the advantage that it is a *ceteris paribus* analysis which allows disentangling the effects of each individual explanatory variable.

We now define and motivate the different explanatory variables. We assume that the level of competence can be assessed by the quality of journals in which the co-authors have published before jointly authoring the focus article. In the model, we also include the proportion of articles that these authors have published alone, because sole author papers

suggest a unique expertise and reputation, and are found to receive more visibility (Piette and Ross, 1992), a finding that attracted a considerable debate. We do not include the number of citations received by co-authors prior to the focus article because this variable serves to calculate the benefits.

Figure 2: The drivers of co-authorship benefits



On the relationship side, we retain two sets of variables influencing co-authorship benefits: proximity and partnership experience. Geographical proximity is assessed with authors' affiliation. Proximity is considered high when authors either work in the same institution (i.e. university or research lab) or in the same country. Partnership experience is measured through four variables. The first two variables concern the experience of the two co-authors together (the number of articles they have published together and the number of years since

their first article together). The last two variables refer to the experience of co-authorship in general, before and after the focus article, of the two co-authors separately.

Finally, we include in the model a set of control variables (age and author's status).

Researchers' scientific creativity follows a life cycle characterized by a growth phase until mid-career, followed by a plateau, and a decline (Simonton, 1988). This empirical observation however is subject to a considerable debate for methodological as well as empirical reasons (Jones, 2010). We also include a dummy variable for the first author to identify the effect of asymmetry in the co-authoring partnerships since our sample is constructed so as to ensure a significant difference of reputation between co-authors (see the sample composition).¹

4.3. Hypotheses formulation

A major motivation for co-authoring academic articles is to combine one's own competence and reputation (or reputation of competence) with the partner's (Hudson, 1996). Supporting evidence comes from the observation that joint authorships are more frequent in articles that require a broader variety of specialized knowledge such as empirical papers (Barnett et al., 1988). Yet, Azoulay et al. (2011) find that even major status enhancing events, such as the receipt of a major award have a rather positive, but limited, impact on the number of citations received by articles published after the status-conferring prize. So, the "quality" of future articles, however it is measured, cannot be exclusively associated with the co-author's competence. We therefore retain two different measures of an author's reputation of competence: the average impact factor of publications prior to the joint article, and the proportion of articles published alone. The first variable assesses the importance of

¹ Given that the effects estimated in the model might be systematically different for the focus author and the co-author (which would not be captured by a simple dummy variable), we additionally run separate regressions for the two subsamples.

academic reputation that is expected to motivate co-authorship (Barnett et al., 1988). The second variable measures competence from the angle of personal qualifications that are expressed in single-author articles. The higher the proportion of articles alone, the higher the level of personal competences. This assumption is consistent with the findings of Chung et al. (2009) that partnership with a “prolific” author leads to higher quality articles, and thus on average more citations. Hudson, on the other hand, argues that that co-authorship results in compromise and “smaller imagination leaps” between academic partners have to be taken into account, because they lead to assume that it is less effective to co-publish with a reputed author that might conflict with one’s own creative thinking (Hudson 1996). Because these arguments are valid for both the focus author and the co-author, we derive the following four hypotheses:

Hypothesis 1.1: *The higher the share of articles by the focus author alone, the greater the co-authorship benefits.*

Hypothesis 1.2: *The higher the average impact factor of journals in which the focus author has published, the greater the authorship benefits.*

Hypothesis 2.1: *The higher the share of articles by the other author alone, the greater the co-authorship benefits.*

Hypothesis 2.2: *The higher the average impact factor of journals in which the other author has published, the greater the authorship benefits.*

Turning to the relational dimension of co-authorship, we single out two variables that can be obtained easily from scientific publication databases: partner’s proximity and partnership experience. Proximity is considered greater when the two co-authors are affiliated to the same institution and when they work in the same country. Physical proximity might be

expected to have a positive impact on academic collaboration because it should lower coordination costs (Bruno, 2010). However, while co-authorship between researchers from the same institution is still dominant (Sutter, 2004), it is not found to lead to higher (nor lower) quality publications (Chung et al., 2009). On the contrary, there is evidence that extra-mural collaboration results in positive benefits for co-authors. “In other words, there is somewhat of an inverse relationship between cognitive distance and physical distance in the typical patterns of scientific communication” (Heinze et al., 2009). Using a large database composed of presentations made in a series of professional conferences, with considerable variety in terms of methodologies and focus, Santonen and Ritala (2012) find that most articles published in the conferences’ proceedings are based on “tight clustering based on geographical and institutional boundaries” and “that high performing authors [...] span these boundaries”. Hence, cooperation across institutional and national borders gives access to a broader range of specialized knowledge. This leads us to formulate the following hypotheses.

Hypothesis 3.1: *Same institutional affiliation is associated with lower co-authorship benefits.*

Hypothesis 3.2: *Same country of affiliation is associated with lower co-authorship benefits.*

Co-authorship is a form of cooperation. A strong finding from research on business alliances concerns the positive impact of partners’ cooperation experience on partnership benefits.

Anand and Khanna (2000) find evidence of large learning effects associated with cumulative experience of alliances. Sampson (2005) produces similar results establishing a positive link between experience in managing complex alliances and collaborative benefits in R&D alliances. Kalaignanam et al. (2007) analyze new product development alliances and draw similar conclusions regarding the experience with alliances, although they observe a

difference between the asymmetric partners. While alliance experience is positively associated with financial gains for the “larger” partner, there is no significant effect for the “smaller” one. Carayannopoulos and Auster (2010) find evidence that prior experience with research-driven alliances is more likely to favor alliances as opposed to acquisition as a means to extend corporate knowledge. Thus, there is relative unanimity on the effect of experience, with the exception of Sampson (2002) who cautions that “collaborative benefits are improved most with some experience, but extensive experience does not add to this effect”. Based on this strong background, we formulate two symmetric hypotheses regarding the experience of both co-authors.

Hypothesis 4.1: *The greater the number of co-authors of the focus author, the greater the benefits of co-authorship for both partners.*

Hypothesis 4.2: *The greater the number of co-authors of the co-author, the greater the benefits of co-authorship for both partners.*

The previous set of hypotheses deals with the experience of cooperation in general. We can expect that experience with the specific co-author is likely to also have an impact. To the best of our knowledge, research on co-authorship has not yet touched on this issue and so we decided again to rely on the literature on business alliances that proves to be a fertile ground on this question. The idea that past interaction between people is a major source of trust is well established since Zucker (1986). This effect is so strong that it influences the way companies with “repeated ties” conduct business together, and in particular the choice of governance for their cooperative activities (Gulati, 1985). More recently, Gulati and Stych (2008) revisit the research question and find new evidence that a common history provides additional returns, although in a complex non-linear fashion. Poppo et al. (2008) bring a new perspective on this issue by providing evidence that repeated interaction in the past (the

“shadow of the past”) results in trust building under the conditions that partners expect a continuation of the relationship (the “shadow of the future”). We assume that repeated interaction also exerts a positive effect on co-authorship benefits. To disentangle the role of experience and the role of time, we include two variables to assess experience: the first one is the number of articles published together by the two co-authors, and the second one is the time elapsed since the first co-authored paper. We further assume that only the first variable will yield a positive effect, while the second will be impacted by two contradictory effects. The time elapsed since the first publication may contribute positively to trust, but as the “age” of the partnership grows a negative effect mentioned for the control variable may lead to lower benefits.

Hypothesis 4.3: *The higher the number of articles co-authored together, the higher the benefits for both partners.*

Hypothesis 4.4: *The longer the time worked together, the lower the benefits of co-authorship for both partners.*

5. Data

For the purpose of our study, the initial unit of observation is a pair of co-authors of a joint article (called the “focus article”).

The data is compiled from various sources. We obtain names of the top 1000 economists in terms of publications from the REPEC database. From this, a subsample of 130 authors is randomly drawn (from which data on 129 can be used). For each of these focus authors, a focus article with one single co-author is randomly chosen such that its date of publication is as close as possible to the year 2006.² By construction, our sample almost exclusively consists of asymmetric co-authorship articles, given that the focus author necessarily

² This choice shall guarantee that conclusions across different author-pairs are possible.

belongs to the REPEC top 1000 economists in terms of publications, while this is not necessarily the case for all co-authors.

Data on publications and citations comes from the ISI web of knowledge. Specifically, for each author we collect a list that includes all publications alone, those with the co-author of the focus article and finally those with other co-authors. For each of these publications, we then compile information on the number of citations. From this data, we calculate the number of publications before and after the focus article as well as the average number of citations per publication before and after the focus article. Furthermore, we compute the share of articles that the corresponding author has written alone.

Finally, from the authors' CVs, we obtain the primary affiliation, the nationality, the field of specialization, and the year in which the author obtained his/her PhD. As discussed above, those variables serve as proxies for the similarity between the two authors of the focus article. The year of PhD is used as a proxy for the academic age of the corresponding author. A second proxy for academic age is computed as the difference between the year 2011 and the year of publication of the first journal article.

In order to evaluate the influence of co-authors' benefits, we consider two dependent variables:

(1) The short-term benefit is the difference between the citations obtained in the focus article and the average number of citations prior to it.

Each co-author's short-term benefit is calculated as the difference between the citations received for the joint publication on the one hand and the average citations of the author's other publications on the other hand. By construction of our sample, the second author generally experiences greater "short-term benefits" relative to the first author.

(2) The long-term benefit (subsequent articles)

The long-term benefit is calculated as the difference between the average number of citations in articles subsequent to the focus article and the average number of citations prior to it.

Table 1 provides descriptive statistics on these data for the overall sample as well as separately for the focus author and the co-author. In Panel A, we consider the two different dependent variables of the regressions; Panel B presents the corresponding explaining variables.

Table 1: Descriptive Statistics

	All authors					First author only					Second author only				
	N	Mean	S.D.	Min	Max	N	Mean	S.D.	Min	Max	N	Mean	S.D.	Min	Max
<u>PANEL A: DEPENDENT VARIABLES</u>															
Long-term benefit	235	-22.43	30.62	-232.83	64.34	120	-28.38	35.31	-232.83	64.34	115	-16.23	23.38	-171.94	31.68
Short-term benefit	244	-14.18	40.95	-236.17	256.33	124	-20.24	43.34	-236.17	256.33	120	-7.93	37.49	-175.44	255.58
<u>PANEL B: EXPLANATORY VARIABLES</u>															
Dummy: First author	258	0.50	0.50	0.00	1.00	129	1.00	0.00	1.00	1.00	129	0.00	0.00	0.00	0.00
<i>Information on the pair</i>															
Pair: Time worked together	258	4.58	6.10	0.00	23.00	129	4.58	6.11	0.00	23.00	129	4.58	6.11	0.00	23.00
Pair: Number of articles together	258	4.67	6.07	1.00	35.00	129	4.67	6.08	1.00	35.00	129	4.67	6.08	1.00	35.00
Pair: Same affiliation	250	0.12	0.33	0.00	1.00	125	0.12	0.33	0.00	1.00	125	0.12	0.33	0.00	1.00
Pair: Same country of affiliation	248	0.59	0.49	0.00	1.00	124	0.59	0.49	0.00	1.00	124	0.59	0.49	0.00	1.00
<i>Information on the author</i>															
Author: Academic age (time since first article)	227	17.59	9.49	-16.00	47.00	115	21.73	8.24	-16.00	47.00	112	13.35	8.81	0.00	40.00
Author: Share of articles alone	255	0.33	0.22	0.00	0.94	127	0.37	0.22	0.00	0.94	128	0.30	0.21	0.00	0.92
Author: Number of co-authors	257	21.98	18.01	1.00	99.00	129	27.95	19.18	2.00	99.00	128	15.96	14.50	1.00	99.00
Author: Average impact factor of publications before focus article	244	1.28	0.38	0.07	3.11	124	1.33	0.33	0.07	2.50	120	1.24	0.43	0.33	3.11

Notes: In this table we report descriptive statistics on the variables used in the regressions. Panel A presents the different dependent variables, Panel B shows the explanatory variables.

Panel A of Table 1 shows that, on average, the second author benefits more in terms of both short-term and long-term benefits induced by the collaboration in the focus article.³

In terms of the explaining variables, Panel B of Table 1 reflects the asymmetry between the focus author and the co-author, which is consistent with the construction of our sample. On average, the second author is younger in terms of academic age (13.43 vs. 21.51 years since PhD for the first author) and has a smaller average impact factor regarding publications written prior to the focus article (1.24 vs. 1.32 for the first author). He/she also possesses a smaller academic network of co-authors (16.48 vs. 27.44 for the first author), and has sole-authored a smaller share of articles (29% vs. 38% for the first author). This latter point reflects the increasing tendency to co-authorship observed over the past decades, or perhaps a lower level of unique competence. Together, these results confirm that our sample is indeed composed mostly of asymmetric academic partnerships and suitable for the investigation of the benefits of co-authorship in this particular context.

A curious phenomenon in bibliometrics research is the so-called “prolific authors” (Chung et al., 2009). These are authors that publish frequently and receive a lot of citations. By construction, the economists ranked in the REPEC top 1000 list belong to the most “prolific” authors in this discipline. Due to the process through which we (randomly) select the co-authors, it is possible that the second author would also be a member of this selective list. Therefore, we identify all articles in our sample that are co-authored by two members of the top 1000 list. The share of focus articles published by these authors in our sample is 25.6% (33 out of 129 pairs). Compared to the other pairs, they indeed receive a statistically significant (tested via t-test) higher number of citations both before and after the focus article. However, interestingly there is no statistically significant (again tested via t-test)

³ The fact that both long-term and short-term benefits exhibit negative mean values is due to the fact that articles prior to the focus article are less recent than the focus article itself and all other subsequent articles and thus tend to have more citations at any given point in time.

difference in either form of co-authorship benefits. As a sensitivity experiment, we “dummy out” those prolific authors, but the corresponding dummy coefficient is insignificant in the regressions and the other results do not substantially change.

Finally, it should also be noted that in some of the cases in which both the authors selected first and second are part of the REPEC top 1000 economists in terms of publications, the second author is actually ranked higher than the one selected first. In these cases, we reassign the status of author and co-author. Hence, in the entire final sample, the focus author has a higher number of citations and a higher average publication impact factor. In other words, we are sure that there is asymmetry of reputation between the focus author (reputed more “senior”) and the co-author (the “junior” one) throughout the sample, although the gap among them varies considerably.

Table 2: The drivers of long-term co-authorship benefits

	All authors	First author only	Second author only
Dummy: First author	-13.6228**		
<i>Information on the pair</i>			
Pair: Time worked together	-1.3869***	-1.3657	-1.1675**
Pair: Number of articles together	1.1127**	1.3175*	0.8131
Pair: Same affiliation	5.6788	2.8456	0.8993
Pair: Same country of affiliation	-17.6253***	-18.2306**	-12.6899**
<i>Information on the author</i>			
Author: Academic age (time since first article)	-0.5935*	-0.4387	-0.5457
Author: Share of articles alone	21.4239*	56.2476***	-8.1688
Author: Number of co-authors	-0.1067	0.0093	-0.1606
Author: Average impact factor of publications before focus article	12.9390**	35.5492**	2.6546
<i>Information on the co-author</i>			
Co-author: Academic age (time since first article)	0.1678	0.5311	-0.2757
Co-author: Share of articles alone	-31.9872***	-67.2091***	-9.5711
Co-author: Number of co-authors	-0.1485	-0.014	-0.0655
Co-author: Average impact factor of publication before focus article	-4.9315	-15.9249*	15.041
Constant	0.0182	-46.6886*	-6.8582
Adjusted R²	0.18	0.21	0.12
N	186	93	93

Significance levels: * 0.10, ** 0.05, *** 0.01

Table 3: The drivers of short-term co-authorship benefits

	All authors	First author only	Second author only
Dummy: First author	-10.1815		
<i>Information on the pair</i>			
Pair: Time worked together	-1.0709	-1.0712	-1.1267
Pair: Number of articles together	0.9886	1.0338	0.8864
Pair: Same affiliation	-0.1443	0.1268	-7.3427
Pair: Same country of affiliation	-8.5222	-10.5075	-0.764
<i>Information on the author</i>			
Author: Academic age (time since first article)	-1.1309***	-1.2019*	-1.0101*
Author: Average impact factor of publications before focus article	18.5044**	50.1930***	2.5675
<i>Information on the co-author</i>			
Co-author: Academic age (time since first article)	-0.5269	-0.1946	-1.1022**
Co-author: Average impact factor of publications before focus article	5.4952	-10.1054	36.9951**
Constant	-5.7588	-39.6934	-19.0001
Adjusted R²	0.09	0.07	0.11
N	192	96	96

Significance levels: * 0.10, ** 0.05, *** 0.01

6. Discussion of results and implications

We now turn to the regressions analysis. Tables 2 and 3 provide different specifications of regressions of the long-term and short-term benefits of co-authorship on the explaining variables for the whole sample, as well as separately for the focus author and the co-author.

6.1. Discussion of results

Overall, our model receives substantial support for the long-term benefits, but less when it comes to the short-term benefits of co-authorship. We will discuss in parallel the results for both types of benefits, following the list of hypotheses and considering the regression results for all authors. We will focus separately on the author and the co-author.

To start with, the regression results from Table 2 provide evidence in support of our hypothesis that co-authorship benefits in asymmetric collaboration are in favor of the “junior” partner (negative and significant coefficient of the dummy author 1). These results, however, are significant only with respect to long-term benefits.

Some of our hypotheses around co-authors’ reputation of competence receive strong and significant support in a specific direction (H 1.1 and H 1.2). The benefits of collaboration are strongly associated with the author’s own track record, especially for the focus author. By contrast, the track record of the co-author has an adverse effect: the greater the share of sole-authored articles, and even the higher the average impact of previous publications of the co-authors, the lower the benefits. These results would suggest that a senior author would obtain more benefits when partnering with a less reputed researcher.

The positive effect of the author’s own reputation of competence, measured by the average impact factor of publications before the focus article, is valid for the focus authors and the

co-authors when it comes to short term benefits. The coefficient associated to the “average impact factor of articles published prior to the focus article” is positive and significant. Again, the message seems to be “count on your own force” if you wish to gain visibility.

Our hypotheses on proximity (H 3.1 and H 3.2) receive substantial support, but only for the long-term benefit regressions. The variable “same country of affiliation” comes with negative and highly significant coefficients. International co-authorships seem more effective to obtain visibility. Academic partners need to have a strong reason to reach out to a distant co-author to justify the higher cost of coordination. That reason can be a greater difference of research capabilities between co-authors (Bruno, 2010).

We find no support to the hypotheses regarding co-authorship experience as measured by the time co-authors have worked together. Actually, the coefficients are negative in the long-term benefit regressions, suggesting that the “age” of a partnership has a negative influence on its performance. This could be related to the life cycle pattern of research that reaches a decline phase as time passes. But the hypotheses regarding previous interaction with the same co-author receive strong and regular support (H 4.3) for the focus author. As expected, “repeated interaction” with the same co-author has a positive effect.

It is useful to explore in more detail the impact of experience that co-authors have together. To do so, we replace the variable denoting the number of joint articles by five dummy variables to capture whether focus author and co-author had respectively 1, 2, 3, 4, 5 or more joint publications. The impact on benefits is positive for each of these dummies and increases with the number of joint publications (e.g. it is larger for 5 joint publications than for 3 joint publications), but is only significant for 5 publications or more.

The implication would be that co-authorship pays off over the long-term and that rather than changing academic partner repeatedly, co-authors would be well advised keeping the same partner over an extended period of time.

6.2. Implications

The evidence described above suggests that our model validates the parallels drawn between business alliances and academic co-authorship.

The benefits of co-authorship are more favorable to the “junior” academics (the “co-author”), than to the “senior” partner. However, the implications suggested by the analysis of what drives the benefits are substantially different.

The junior co-author benefits (expected increased citations from the focus article) in the short-term, the more so when he/she has a strong track record prior to the focus article with a senior academic. This is even more likely if he/she is of a young academic age. When it comes to long-term benefits (the number of citations expected from articles subsequent to the focus article), those will be higher if the “senior” co-author is from a different country of affiliation and the focus article was published at an early stage in the career of the junior co-author (time worked together).

The senior author seems to receive lower short-term benefits than his or her junior colleague (i.e. fewer citations than the average of previous articles received), but this loss can be reduced when the focus author has published a high number of sole-authored articles, and is of a younger academic age. When it comes to long-term benefits, the loss can be reduced substantially with a strong academic track record (both a higher share of sole-authored articles and a higher average impact factor of previous publications),

international co-authorship, and a greater number of joint publications with the same co-author.

The effect of repeated interaction (number of articles written with the same co-authors) may suggest that trust in academic relationship plays a similar role as in business partnerships. The kind of trust associated with repeated interaction is presumably linked to the expectation of competence based on experience of past collaboration.

The overall message that arises from our findings appears to attenuate somewhat the positive views that seem to prevail about co-authorship (Wuchty et al. (2007), Chung (2009), Ductor (2011)). The dominant view is, that once certain biases have been taken into account, co-authoring is beneficial in terms of productivity and quality of publications. And arguably co-authors benefits substantially because they would not have produced as many publications of good quality on their own. Our research show that, in situation of asymmetric co-authorship, the short-term and long-term benefits are not necessarily always positive but depend on the characteristics of co-authors and their relationship. We would therefore conclude that the individuals involved in co-authorship should investigate which conditions favor greater benefits from joint publications. We find that junior authors should not overlook the value of sole authorship if they want to increase the effectiveness of their partnerships in subsequent publications.

Our findings are nevertheless consistent with the conclusion of Petry and Kerr (1981). They observe that while co-authors claim they collaborate to gain access to knowledge and skills of the academic partner, co-authorship is more frequent when the employer's (e.g. the university's) reward system makes no difference between single-authored and co-authored papers. They consider that the learning obtained from co-authoring is an important benefit because it develops scholarly capabilities, presumably for future

publication. Our findings regarding long-term benefit bring some support to this perspective. Co-authorship should not be seen only as a short-term venture, but rather may pay off for junior academics in the long term.

7. Conclusion

In this paper, we explore the distribution of benefits between co-authors endowed with asymmetric resources, measured in terms of scientific reputation and standing. We analyze a sample of authors who have jointly contributed to a (“focus”) article and we measure how much each has benefitted from this publication in terms of citations relative to his/her previous experience. We considered two measures of improvement: (1) the increase in the number of citations, compared to the publications prior to this “focus” article, (2) the increase in the number of citations for all their publications subsequent to the “focus” article, compared to the publications prior to this “focus” article. While we observe that the junior author (less experience, lower scientific reputation and standing) typically benefits more (higher increase of citations), these benefits are greater when the author has a larger personal track record of sole authored articles.

In sum, our findings do not provide support to the widespread assumption that co-authorship always benefits the authors’ reputation of competence. Instead we find that the gains of co-authorship are also associated with one’s own competences, and on the quality of relationship obtained from past academic interactions with the same co-author.

Our research findings are, however, based on a relatively specific, and somewhat limited, set of scholars in economics. We chose economics as a field of research because there is a relatively high proportion of “duo” co-authorships that are easier to analyze than large teams of co-authors. The same methodology could usefully be applied to other fields of research and broader samples.

In this paper, we rely on a relatively straightforward approach that consists in measuring the increase or decrease of citations through comparison of publication scores and averages. In other words, our model applies a comparative statics methodology that provides a partial view of the reality observed. A dynamic growth model would certainly provide a more thorough understanding of these mechanisms.

We are also aware of the fact that co-authorship does not fully reflect intellectual collaboration. Sometimes, co-authors may not have actually “worked” on the paper, but have merely provided resources to the other author(s), whereas a scholar who may have been critical to an academic achievement is perhaps not mentioned as a co-author, but simply in the acknowledgments (Katz and Martin, 1997). But our research questions effectively concerns the distribution of benefits between the two “official” authors.

Altogether, however, our findings have shed new light on the implications of co-authorship for scholars. Co-authorship has become pervasive, if not dominant, in the world of research, both academic and industrial, and actors need to gain a better understanding of the consequences, both positive and negative, for the researchers concerned, for research organizations, and for society at large.

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