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The hog-cycle of law professors

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The Hog-Cycle of Law Professors*

Christoph Engel / Hanjo Hamann

Abstract

The market for law professors fulfils the conditions for a hog cycle: in the short run, supply cannot be extended or limited; future law professors must be hired soon after they first present themselves, or leave the market; demand is inelastic. Using a comprehensive German dataset, we show that the number of market entries today is significantly negatively correlated with the number of market entries 8 years ago. This is quite precisely the time young scholars on average take to prepare for the market. To get this estimate, we detrend the data, and we control for the size of student cohorts when these candidates enter university. This control variable mediates the effect of birth cohorts when candidates are born, which themselves exhibit negative autocorrelation, with a lag of some 20 years. Using our statistical model, we make out of sample predictions for the German academic market in law until 2020.

Keywords: market for law professors, hog-cycle, time series, out of sample prediction

JEL: C22, D22, D84, D92, J22, J45, K00, K23

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I. Introduction

Is there anything hogs and law professors have in common? Surprisingly, the answer is yes. The production of both follows similar cycles. If there have been too many hogs on the market, a year or two later the number of hogs on offer is too small. If demand for hogs has exceeded supply, a year or two later the market is swamped with pork. If there have been too many law professors on the market, some eight years later the law schools have problems filling vacancies. If the law schools have had a hard time filling open positions, some eight years later many first-rate legal scholars cannot find a decent job.

Now future law professors are of course not hogs, tenure is not slaughter, and hiring a new assistant professor is not breeding. Yet when observing the fluctuations on the market for law professors, with tongue in cheek German law professors sometimes mumble: it's like a hog cycle. In this paper we read this sigh as a testable proposition. We show that the German market for law professors fulfils the theoretical conditions for the emergence of a hog cycle. Yet ultimately it is an empirical question whether future candidates, and the established professors giving them postdoc positions, do at all think in categories of supply and demand, and whether the logic of the hog cycle is mitigated by additional forces that are not part of the theoretical model. It is the purpose of this paper to provide this empirical test.

For the empirical test, we exploit the fact that German law formalises market entry, and keeps it distinct from hiring. In Germany, rare exceptions notwithstanding, candidates are only eligible for becoming law professors if they have passed "habilitation" (from Latin *habilitare*, to qualify).[1] Habilitation is a formal procedure by which the entire faculty testifies that a candidate is competent to teach law. It requires writing a second book, having a decent list of publications, and convincing the entire faculty during talk and discussion. The faculty that has granted habilitation is prevented by law from itself hiring this candidate. Instead the new *Privatdozent*[2] must go on the market and hope to be hired by a different faculty. We have data on the number of scholars who have passed habilitation from 1960 until 2009. This gives us a precise measure for the development of the supply of law professors over time.

A typical German post doc in law holds a position for the duration of six years. Practically, finishing the second book often takes a bit longer (and postdocs and their supervisors need to creatively find her a living for that extra period). A hog cycle with a duration of six to nine years would therefore be in line with expectations. If we just test for negative autocorrelation in the raw data, we establish significant lags from 9 to 16 years. Apparently we are missing forces other than the hog cycle that also lead to autocorrelation. It turns out that the size of student cohorts when these candidates enter university is this missing element. When controlling for student cohorts, we find a very plausible lag of 8 years. This is how long young German legal scholars on

1 Köbler, Gerhard: Mittellateinisches Wörterbuch, 2011 (http://www.koeblergerhard.de/Mittellateinisches-HP/VorwortMlat-HP.htm)

2 The term means literally: this person has the right to teach, but does not hold a position, and therefore also no salary.

average take to prepare for the market. Results do not change if we further detrend the data, if we also control for birth cohorts, and for the available proxies for alternative career paths. The result also holds if, as a robustness check, we use a series of alternative specifications of the statistical model.

It would be tempting to turn our result into a piece of advice for young lawyers contemplating to start an academic career. Since the determining factors (negative autocorrelation with a lag of 8 years, the size of student cohorts, the time trend) are already known, we are able to make out of sample predictions for the time until 2020. We predict another steep increase in the number of lawyers applying for open positions as law professors. Reading our paper, the next generation might spend more energy exploring alternative career options, as a way of breaking the cycle. Yet this strategy only makes sense at the individual, not at the collective level. Ultimately, individual success presupposes that one outsmarts the crowd.

To the best of our knowledge, we are the first to demonstrate a hog cycle in the production of law professors. In the theory section, we report the literature on hog cycles in different markets. There is one predecessor paper regarding the German market for law professors, covering the period from 1949 to 1969 (Rüthers 1972), but it only reports aggregate descriptive statistics.

The remainder of the paper is organised as follows. In section 2 we develop the theoretical hypothesis we want to test. In section 3 we describe our data. In section 4, we explore our hog cycle hypothesis by testing for negative autocorrelation: If a large number of candidates has passed habilitation x years ago, the number must be small today and vice versa. We show that this is indeed the case, but that the significant time lag is implausibly high. In section 5 we add our control variables and find a time lag with a very plausible eight years. Section 6 concludes by using our empirical model to predict the supply of law professors for another 10 years.

2. Theory and Hypothesis

As its name suggests, the hog cycle concept hails from agricultural economics. The first academic papers on the phenomenon date back almost a century (Haas and Ezekiel 1926; Hanau 1928). They have immediately been translated into a piece of practical advice for farmers, urging them to adopt an anti-cyclical investment policy (Baade and Abeking 1930). Nobel Prize winners Ronald Coase (Coase and Fowler 1935a; Coase and Fowler 1935b) and Paul Samuelson (Samuelson 1976) have contributed to this literature, as well as a long list of agricultural economists (Harlow 1960; Maki 1962; Larson 1964; Jelavich 1973; Shonkwiler and Spreen 1986; Hayes and Schmitz 1987; Chavas and Holt 1991; Holt and Craig 2006). Similar phenomena have been documented on the market for potatoes (Ezekiel 1938; Simmons 1962), for real estate (Wheaton 1999; Wernecke, Rottke et al. 2004), for oil (Krugman 2001) and for nurses (AbuAlRub 2007).

Figure 1 illustrates the concept of a hog cycle with the example that started the literature. As one sees, apart from a positive time trend (in the long run, Germans spent more money on buying pork), pork prices were fluctuating cyclically, resulting from cycles of over- and undersupply.

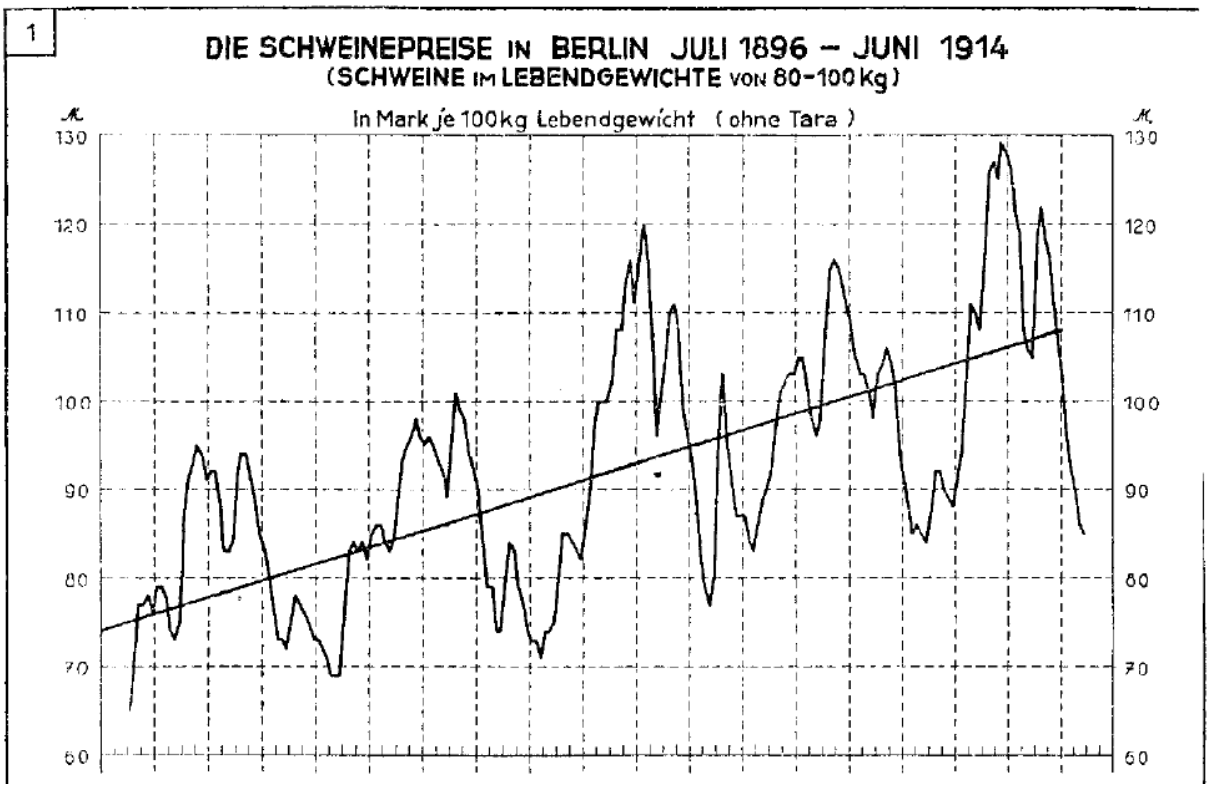

Figure 1
Hog Cycle That Started the Literature

from Hanau (1928: 10)

Theoreticians call the underlying logic a cobweb (Ezekiel 1938; Stein 1992). Three conditions must be fulfilled for a cycle to emerge: (1) production in the short run cannot react to changes in demand; (2) the product in question is perishable; (3) demand in the short run does not increase if there is more supply (Ezekiel 1938). Hogs meet all three conditions: Newborn hogs need time to mature; there is the optimal moment for slaughter; if pork is cheap, people hardly eat more. Assume the demand for pork drops unexpectedly, say since consumers dread swine flu. Farmers have to lower prices if they want to sell any pork. Since this meant that profit was low, this year they breed less pigs. If these pigs are ripe for slaughter, supply is small and prices are high. Farmers react by breeding a larger next generation. When those come to the market, supply is in excess of demand. What originally was an exogenous shock has triggered a cycle.[3] Of course,

3 Provided supply and demand react symmetrically, i.e. provided the elasticity of demand is similar to the elasticity of supply, the cycle returns to its origin. If supply is more elastic than demand, with every repetition the cycle swings more intensely. If demand is more elastic than supply, eventually the cycle vanishes (Ezekiel 1938).

there is no cycle if a sufficiently large fraction of farmers anticipate the cycle and adapt their breeding policy (Schultz 1958; Muth 1961).

In the market for law professors, the conditions necessary for the emergence of a cycle are fulfilled:

(1) Becoming a law professor takes time. In the German system, only scholars are eligible that have earned their Dr. juris.[4] The standard career path follows the apprentice system. Some esteemed law professor hires the future colleague as a post-doc. Once the post doc has been hired, it is rare that she leaves academia before finishing habilitation. Having spent additional time at the university would not give her an advantage on the market for non-academic lawyers. To the contrary she will be perceived as someone who is at least not inclined to do practical work, if not poorly equipped for the challenges of legal practice. Holding a post-doc position is thus perceived as a negative signal by the market for non-academic lawyers. Most post-docs would also regard it as personal failure if they did not pass habilitation; they stick to their habilitation plans not least for reasons of self-esteem. The typical post-doc position is for the duration of six years, with the possibility of a short prolongation. There is thus a considerable time lag between the decision to prepare a new scholar for the market and the moment when she can apply for a position. For all of these reasons, in the short run the supply of law professors is inelastic.

(2) Most *Privatdozenten* are on the market for a year or two. If they have not found a position within three or four years, odds are low that they ever will. The law faculties take the fact that a *Privatdozent* has not been hired by other faculties as a signal that something must be wrong with this candidate. Once a *Privatdozent* has taken up a position in legal practice, returning to academia is close to impossible. This makes future law professors a perishable commodity. Note that future law professors also have very little room for changing the moment when they enter the market, in anticipation of changing market conditions. Speeding up writing the book is a frequent plan, but it hardly ever succeeds. Postponing habilitation is usually not possible either since positions expire.

(3) Finally, to date there are only two private law schools.[5] The remaining 42 law faculties (and other faculties for, say, business or technology that occasionally hire lawyers) are funded by the state.[6] This helped the faculties during the financial crisis, as faculty budgets were basically unaffected. Yet it also means that faculties cannot react to the supply of more excellent candidates by creating new positions. Moreover, professors are public servants, with salaries fixed by statute. Therefore faculties can also not react to excess supply by lowering prices. Sadly if there are more good candidates than the market can take, the market does not clear. Those who have not

4 The best analogue in the US system is the J.S.D. (not the Juris Doctor, i.e. the J.D.)

5 Bucerius Law School in Hamburg, est. 2000, and EBS University for Business and Law in Wiesbaden, est. 2011. Another private law faculty, the Hanseatic University in Rostock never got off the ground and was closed in 2009, only two years after its establishment.

6 For a complete list see http://de.wikiversity.org/wiki/Liste_der_juristischen_Fakult%C3%A4ten_in_Deutschland.

been hired must change their profession. Most of them join law firms. The third condition for a cycle is thus also fulfilled. Demand is not elastic enough to parry fluctuations of supply.

In the past, the German market for law professors has occasionally been hit by exogenous shocks. The two most prominent shocks happened to be positive ones. In the 60s and early 70s, the German government decided to heavily invest into university education. No less than 15 new law faculties were founded.[7] Many additional law professors were needed to fill these new positions. The next shock came with reunification. The former German Democratic Republic had five law faculties,[8] and four more were established shortly after reunification.[9] Since most East German law professors were believed to be too close to the Communist regime, most of them soon lost their positions. They were replaced with candidates from the West. In both periods, demand heavily exceeded supply. In theory, either shock would have been sufficient to start a hog cycle.

In the introduction, we have explained why we have reason to expect the cycle to have a duration between six and nine years. This leads to our

Hypothesis: The supply of German law professors exhibits negative autocorrelation with a lag between six and nine years.

3. Data

Ideally for each candidate who has applied for habilitation we would like to know a family name, a given name, the name of the habilitating university, the subdiscipline (private, public or criminal law) and, most importantly, the year of the habilitation procedure. We can get thisinformation from two partly overlapping sources:

A statute from 1969 created the German National Library and obliged all publishing houses to submit one copy of each newly published book to that library.[10] Based on these submissions, the "German National Bibliography" has subsequently been compiled and published. If the book in question is a habilitation thesis, this is noted in the bibliography, together with the year of the habilitation procedure. To the extent possible, the statute on the German National Library was applied retroactively. Data for habilitations seems reasonably reliable from 1960 onwards.

Unfortunately, sampling has revealed that this data is partly incomplete. To complete the data, we have exploited the fact that a sort of Who's Who of academics, the *Kürschners Gelehrtenkalender*, has just been made available electronically.[11] In this digest, professors of all disciplines at

7 Augsburg, Bayreuth, Bielefeld, Bochum, Bremen, Düsseldorf, Gießen, Hagen, Hamburg II, Hannover, Konstanz, Mannheim, Osnabrück, Passau, Regensburg.
8 Humboldt University in Berlin, Halle, Jena, Leipzig, Potsdam.
9 Dresden, Frankfurt (Oder), Greifswald, Rostock.
10 Gesetz über die Deutsche Bibliothek v. 31.3.1969, BGBl. 1969 I 265.
11 The database is available at the deGruyter publishing house, http://www.degruyter.de/cont/fb/nw/detail.cfm?id=IS-9783598418822-1.

universities of German language self-report biographical sketches. Since the platform only made it possible to export names, not the year of habilitation, the subdiscipline and the university, we had to complete these data points by hand. Hand coding was also necessary to identify persons who had been invited to contribute to the digest without having passed habilitation. This mainly concerns honorary professors, i.e. practitioners who receive the honorary title of a professor in exchange for teaching students free of charge. We have removed such entries from our dataset.

We have matched these two datasets by name and removed all duplicates. The resulting gross dataset contains 2071 data points. We thus have complete data of 2071 habilitations for the time between 1876 and 2009. (Data from 2010 is still too incomplete to include.) However we truncate our dataset in 1960, before which year we cannot rely on the records to be complete. This leaves us with 1991 data points. There is a predecessor publication reporting descriptive statistics of habilitations in law from World War II until 1969 (Rüthers 1972). It relies on a survey, but unfortunately only reports aggregates. We therefore cannot use this publication to extend our time series further into the past.

Our variable of interest is not individual choices, but the development of supply over time. Therefore in our regressions we work with the total number of habilitations per year. Our original dataset comprises 50 observations. Depending on the length of the lag, it is reduced to the number of years for which we can observe the lag. Given the inevitably small number of observations, it is all the more remarkable that we find very robust results.

Finally, to identify subdisciplines, we have double checked with lists compiled by the associations of private law professors[12], of criminal law professors[13] and of public law professors.[14]

Figure 2 makes it obvious that the production function of law professors has not been smooth. There was a first spike in the early 70s and a second shortly after the year 2000. In the intermediate period, and possibly also in the current years, there is a much smaller supply of law professors. Note that already visual inspection of the raw data suggests a similarity with the hog cycle graph in Figure 1.

12 Zivilrechtslehrervereinigung, http://www.zlv-info.de, accessed on 1 Oct 2010.
13 Courtesy of Prof. Bernd Schünemann in private correspondence on 20 Jan 2011.
14 Vereinigung der Deutschen Staatsrechtslehrer, http://vdstrl.zar-muenster.de, accessed on 1 Oct 2010.

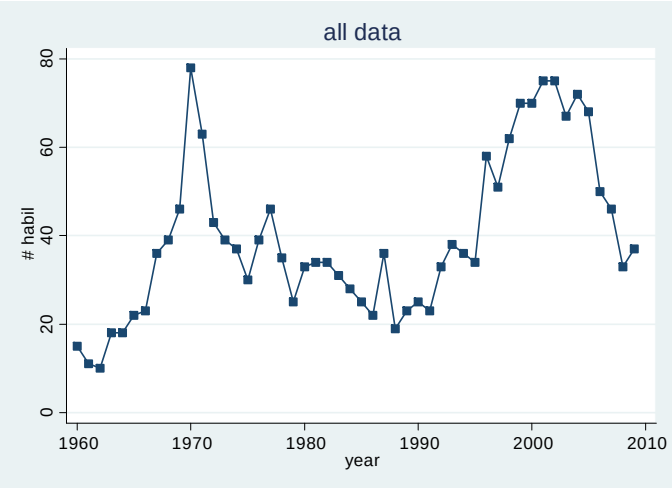

Figure 2
Production Function of Law Professors
Total number of habilitations per year

Figure 3 demonstrates that the development in the subdisciplines was very similar. The only remarkable difference concerns the early spike (which was much more pronounced in private law) and the recent spike (which was much more pronounced in public law). Furthermore, habilitation data in criminal law is more noisy, which may be attributed to the comparably small number of law professors organized in this association. The overall shape of the curve is nonetheless similar. Since subdisciplines do not make a pronounced difference, in the remainder of the paper we work with the complete data set.

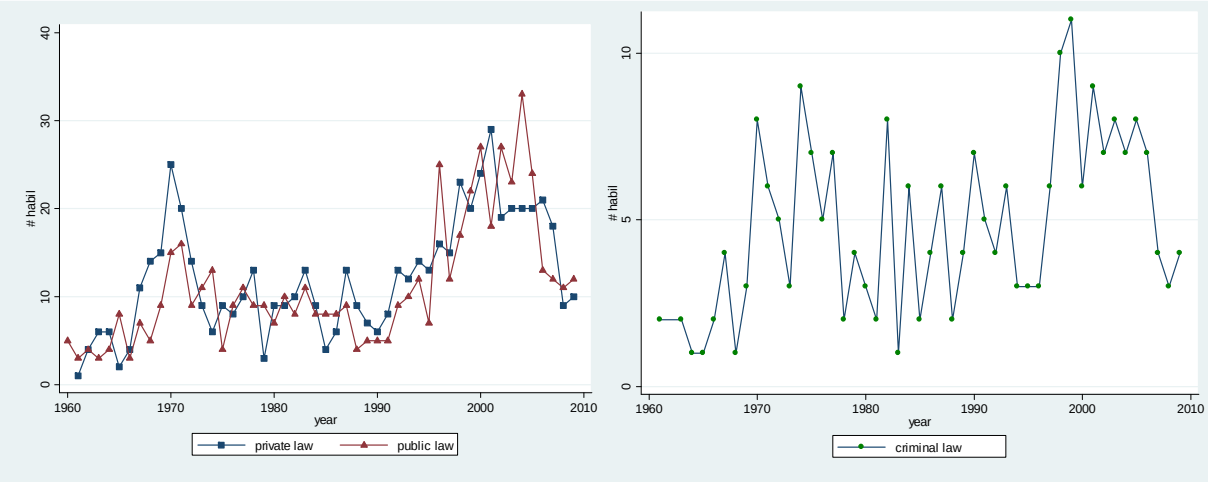

Figure 3
Development in the Three Institutionalised Subdisciplines

4. Pure Autocorrelation

If there is a hog cycle of law professors, the supply of professors today must be negatively correlated with the supply of professors x years ago. As a first test for our hypothesis, we estimate time series regressions with an autocorrelation term. Specifically we estimate

$$y_t = \alpha + \rho y_{t-x} + \varepsilon_t \quad (1)$$

where y_t is the number of habilitations in year t, α is a constant term, y_{t-x} is the number of habilitations x years ago and ε_t is residual error. The coefficient of interest is ρ, which we expect to be negative and significant, at least for some time lags. The peaks in Figure 2 suggest that the data might be heteroskedastic, which is why we estimate Huber-White robust standard errors.

Autocorrelation requires the coefficient for the number of habilitations x years ago to be significantly different from zero. Figure 4 compresses the findings from 14 time series regressions with different lags. It illustrates two findings: First, all coefficients are negative, i.e. below the zero line. We thus do find a hog cycle. If there have been many habilitations in the past, the statistical model predicts few habilitations today, and vice versa. This is what we expected. Yet against our expectation, the error bars indicate that all lags from 9 to 16 years are significantly different from zero. Apparently not only relatively recent developments seem to matter, but even the number of habilitations 16 years ago seems to determine how many professors are on the market today.

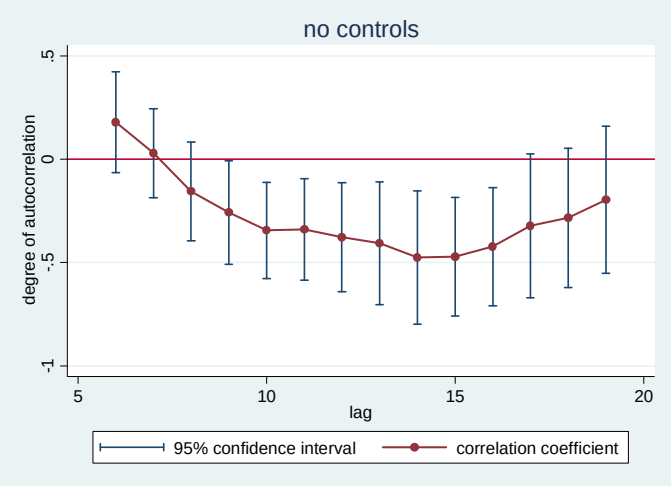

Figure 4
Autocorrelation (absent controls)
Each dot is the coefficient of the lag of the number of habilitations x years ago from the regression of (1)
Error bars are calculated from the standard error of this regressor

A lag at the lower bound of our expectation, i.e. a lag of 6 years, is clearly insignificant. By contrast a lag at the upper end of our expectation, i.e. a lag of 9 years, is weakly significant (p = .051), Table 1. The model predicts that there are 52.82 new law professors on the market every year, minus .258 times the number of habilitations 9 years ago. Since this number has never been

zero, the predicted number of habilitations is always smaller than 52.82, but the more so the larger the supply in the past. The negative correlation is pronounced. Four habilitations in the past seem to deter one habilitation now.

lag9	-.258^{+}
cons	52.816***
N	41
p model	.0051
R^2	..0585

Table 1
Pure Autocorrelation
depvar: # habilitations in year x, robust standard errors
*** p <.001, ** p < .01, * p < .05, $^{+}$ p < .1

5. Adding Control Variables

Our data thus supports the theoretical prediction of negative autocorrelation. We also support a lag at the upper end of our expectation. Yet much deeper lags are also significant, they are even more pronounced, and have smaller p-values. These apparent findings are implausible. Take the lag with the lowest p-value, a lag of 15 years. It would require that the large majority of future professors decides to become an academic shortly after entering university. Even this rare species usually proffers a fallback option, like becoming a judge or an attorney. The long lag of 15 years presupposes that they do not reconsider the fallback option in the light of the information then available, when they assume their post-doc position. This is highly implausible.

There are also statistical reasons to revisit the estimation. The best performing model with just one lag only explains 13% of the variance. Obviously a lot of the fluctuations in the supply of law professors are still unexplained. More importantly even, as long as we miss those additional factors that determine the development of habilitations over time, due to omitted variable bias the coefficients of that time lag(s) in Table 1 risk being inconsistent. In this section we therefore turn to the major additional explanatory factors, which we add as control variables.

a) Time Trend

The left panel of Figure 5 shows that, despite the fluctuations, the number of habilitations grows over time.[15] Over the 50 years of observation, legal academia has been growing. Candidates have been sensitive to this overall time trend. The right panel of Figure 5 supplements the autocorrelation from Figure 4 with a control for this time trend.

15 Technically, the line is the predicted number of habilitations if we exclusively regress the yearly output of law faculties on the time trend.

The most important message from Figure 5 concerns robustness. Controlling for the time trend not only does not make autocorrelation disappear. It to the contrary even makes the autocorrelation coefficients larger, and p-values smaller. We now find a significant hog cycle of any length from 8 to 19 years; only the 8 and 9 year lags are in line with our expectation.

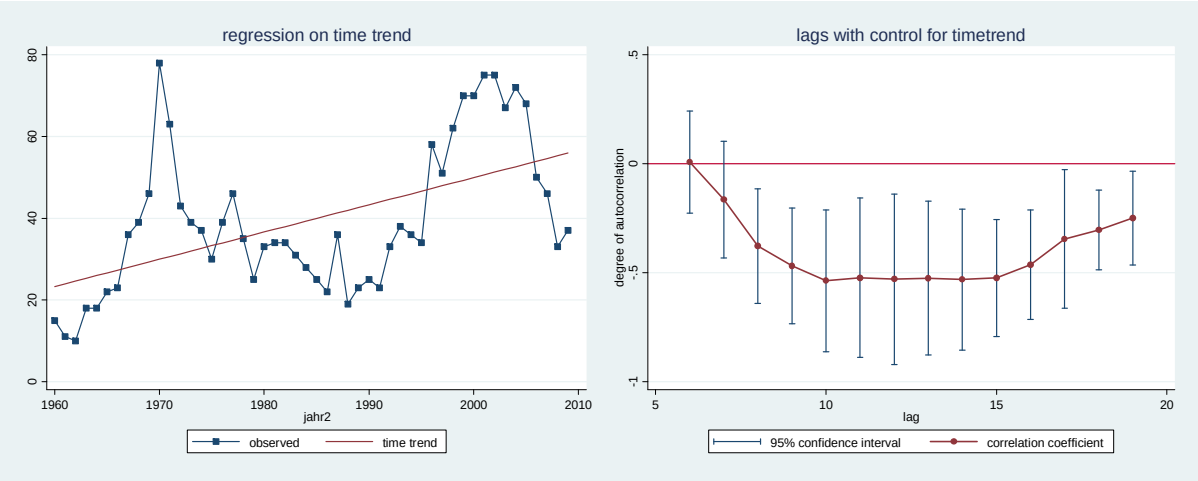

Figure 5
Adding Time Trend
Each dot is the coefficient of the lag of the number of habilitations x years ago
Error bars are calculated from the standard error of this regressor

The regression of Table 2 shows that controlling for the time trend is indeed important. The trend is positive and strong. Everything else held constant, there are two more habilitations every third year. The time trend is significant at the 1% level. As one sees from the considerably larger R^2 , adding the time trend indeed improves the model. But this model in line with our theory still competes with many alternative specifications that seem to refute our theory.

time trend	.712**
lag9	-.469**
cons	39.652***
N	41
p model	.0002
R^2	.2612

Table 2
Adding Time Trend
depvar: # habilitations in year x, robust standard errors
time trend is 0 in 1960, and grows by 1 every year
N depends on duration of lag
*** p <.001, ** p < .01, * p < .05

b) Birth Cohort

The German apprenticeship model of academic careers takes considerable time. When they are on the market, future law professors are around age 40.[16] One should expect that there are more candidates the larger the respective birth cohort. The number of those who bring the right talents should be more or less proportional to the number of those born forty years before. Consider Figure 6, which depicts data on birth cohorts from the German Federal Bureau of Statistics.

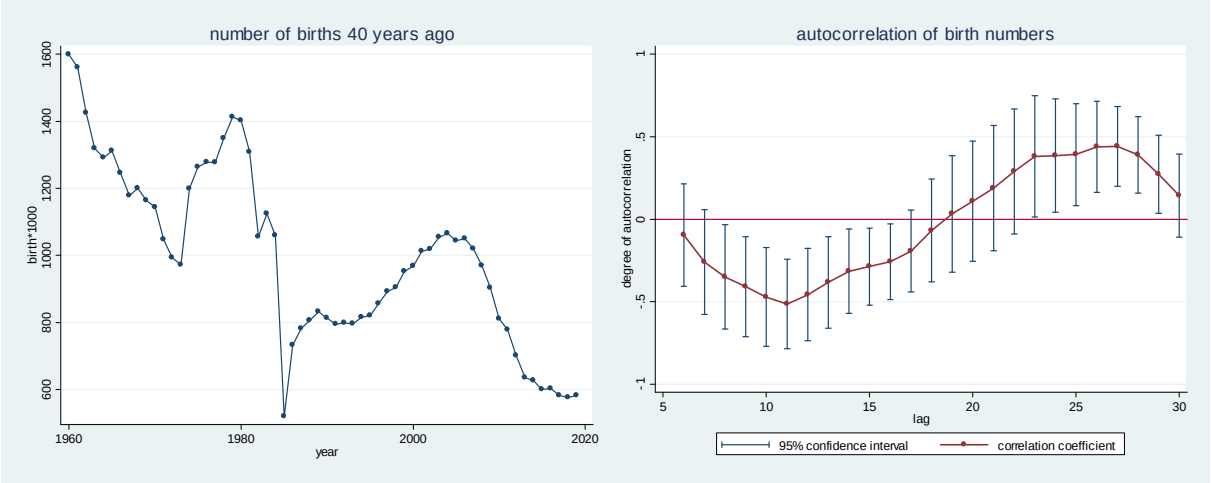

Figure 6
Development of Birth Cohorts over Time

Figure 6 illustrates why birth cohorts are relevant for understanding the production function of law professors. The data contain several structural breaks: one drop in birth cohorts, presumably caused by the economic crisis in the early 30s (playing itself out in the early 70s) and an even more pronounced dip, which resulted from the end of World War II (and played itself out in the mid 80s). Conversely, steep increases resulted from the baby booms in the early Nazi years (becoming effective in the late 70s) and during the recovery after World War II (peaking in the early 2000s). Overall there is the clear negative trend characteristic of modern affluent societies.

The right panel of Figure 6 is even more important. It shows that birth numbers also exhibit autocorrelation. The autocorrelation is negative in the short run, and most pronounced around 11 years, and positive in the long run, with a peak at 27 years. Now the original time series regressions from Figure 4 cannot discriminate between the two channels of negative autocorrelation: the one resulting from parents' decisions on family planning, and the other resulting from the future candidate's decisions on her own career. Controlling for the size of birth cohorts will isolate the latter effect.

16 Between 1980 and 2008, the mean age at habilitation has been 39.76, sd. .92 (calculated from age data by the German Federal Bureau of Statistics, published in their schedule 4.15.2a and in table 18 of the German Scientific Council's printed matter 5125-02).

Figure 7 shows that adding this control variable has a profound effect on the estimation of auto-correlation. With this control variable (and the time trend) the best performing lag is at a much more plausible 9 years. Lags above 14 years are insignificant.

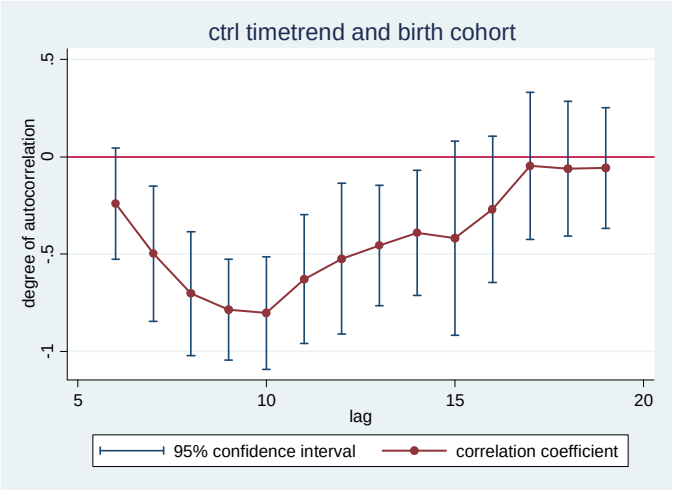

Figure 7
Adding Time Trend and Birth Cohort
Each dot is the coefficient of the lag of the number of habilitations x years ago
Error bars are calculated from the standard error of this regressor

The regression in Table 3 demonstrates the strong effect of the composition of the birth cohort. Roughly one in every 18.000 additional newborns[17] tries to become a law professor forty years later.

time trend	1.257***
birth cohort	.056***
lag9	-.786***
cons	-21.413
N	41
p model	<.001
R^2	.5371

Table 3
Adding Time Trend and Birth Cohort
depvar: # habilitations in year x, robust standard errors
time trend is 0 in 1960, and grows by 1 every year
birth cohort is # of births (* 1000), 40 years ago
*** p <.001, ** p < .01, * p < .05

17 The exact number being 1/.056 = 17.857.

c) Student Cohort

The picture looks similar if, instead, we control for the size of the student cohort of which the future law professor is part. To that end we add the number of students who have been enrolled in German universities 20 years ago as a control variable. We take this data from the German Federal Bureau of Statistics. The lag of 20 years is motivated by the fact that a typical law professor is around 40 when she is on the market, and that Germans typically enter university around age 20. With this control variable, again only shorter lags of the number of habilitations turn out significant. The best performing model now has a highly plausible lag of 8 years.

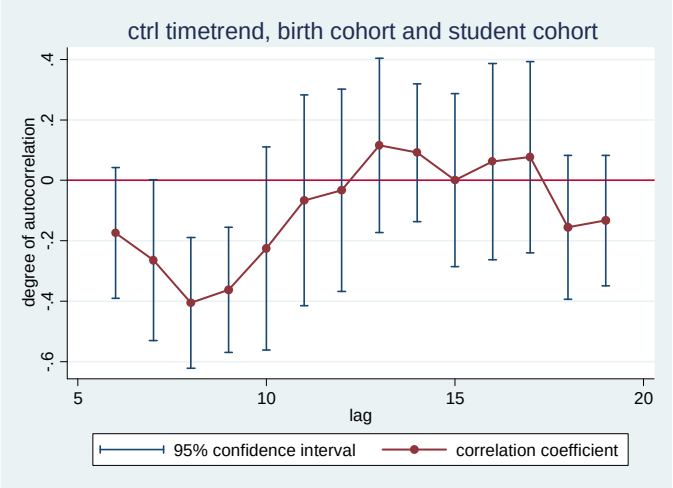

Figure 8
Adding Time Trend, Birth Cohort and Student Cohort
Each dot is the coefficient of the lag of the number of habilitations x years ago
Error bars are calculated from the standard error of this regressor

The regressions in Table 4 show that, once we control for the size of the student cohort, the effect of the birth cohort becomes immaterial. In model 2 the regressor of the birth cohort is insignificant. Adding this control variable does not explain any additional variance. Two more findings are remarkable. With these regressions we explain a huge proportion of the variance, namely more than 75 %. Moreover, once we control for the size of the student cohort, the overall time trend becomes negative. Student cohorts grow faster than calendar time.

Actually we can even be more sophisticated. In model 3 of Table 4, we regress student cohorts 20 years ago on birth cohorts 40 years ago and the time trend. Both coefficients are significant, and have the expected signs: student cohorts grow over time, and they grow faster than birth cohorts (which is why, even when controlling for birth cohorts, the time trend remains significant and negative). In the last step, using the procedure introduced by Sobel (1982), we can test whether birth cohorts have a significant indirect effect on the number of habilitations, mediated by student cohorts (for background see Wood, Goodman et al. 2008). This turns out to be the case (z of indirect effect 3.867, p = .00011). Thus birth cohorts matter chiefly because they affect how many students go to university which, in turn, affects how many graduates can become professors.

	model 1	model 2	model 3
depvar	# habil	# habil	student cohort
time trend	-2.772***	-2.366***	2.210***
student cohort	1.659***	1.522***	
birth cohort		.011	.021***
lag8habil	-.335***	-.405**	
cons	68.087***	53.138**	-44.277***
N	42	42	42
p model	<.001	<.001	<.001
R^2	.7738	.7808	.9353

Table 4
Adding Time Trend and Student Cohort
depvar models 1 and 2: # habilitations in year x, robust standard errors
depvar model 3: student cohort, 20 years ago
time trend is 0 in 1960, and grows by 1 every year
student cohort is # of newly inscribed students in all German universities, 20 years ago
birth cohort is # of births (* 1000), 40 years ago
*** p <.001, ** p < .01, * p < .05

d) Alternative Career Options

Arguably, when they consider preparing themselves for a career in academia, promising young lawyers consider attractive alternative career options. Recall that, once they have become a post doc, it is very unusual for lawyers to leave university and go to practice (unless forced to do so since, past habilitation, they cannot find a job at a university). Therefore the relevant moment for checking out alternative career paths is after having earned their *Dr. juris*, and before taking up a post doc position.

In the German system future law professors typically consider one of two alternative career paths. Those who are interested in earning money would join one of the international law firms. Those more interested in advancing justice, serving their country, or maybe having a couple of children soon (since the system of maternity leave is most generous for public servants), would rather join the judiciary. In Germany, lawyers may become judges right after having finished their legal education. After age 32, the judiciary normally no longer hires, meaning that lawyers stand little chance to become judges should they pass habilitation, but are not hired by a law faculty. All over the country, there are more than 20,000 judges. Careers in the judiciary tend to be slow, but can ultimately lead to the Supreme Court or to one of the prestigious appellate courts. Salaries are rather modest and fixed by statute. Given we have already seen that a lag of 8 years is most relevant, we also check for career opportunities 8 years before a generation of candidates is on the market.

Entry into the judiciary critically depends on hiring. As Figure 9 shows, until the mid-90s, the number of judges has been growing slowly, with the only peak resulting from reunification. We take this data from the biennial employment reports of the German Federal Ministry of Justice.

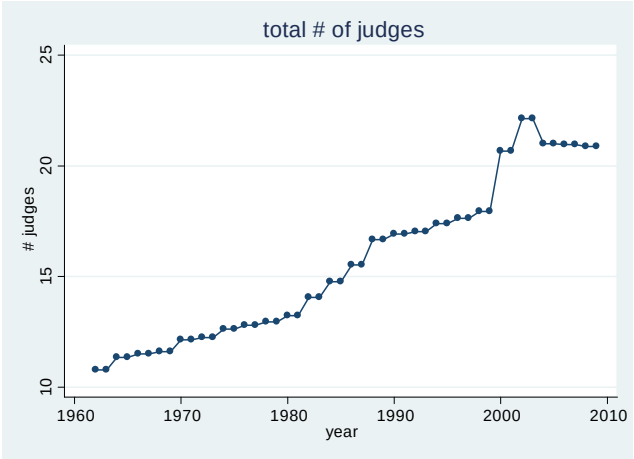

Figure 9
Number of Judges in Germany
y axis: multiply by 1000

As a proxy for earning prospects in the big law firms, we take the development of gross national product; unfortunately, no major law firm has been both willing and able to give us time series data on salaries for associates. As Figure 10 shows, GNP has been growing almost linearly year by year. The turnover of law firms should be positively correlated with the ability of potential clients to pay higher fees which, in turn, should be correlated with GNP.

Figure 10
GNP Development as a Proxy for earning Prospects in Law Firms

The regressions in Table 5 make it clear that alternative career options are not an important determinant in the decision to prepare for an academic career in law. If we do not control for the size of the respective student cohort, in models 1 and 3, we do find a significant effect of these regressors, but it has an unanticipated sign, suggesting that alternative career options make rather than break the case for academia: If the judiciary is large at the moment when a young lawyer decides about her career, she is *more* likely to become a professor. Likewise the larger the gross national product at this point in time, the *more* she is likely to forego the earning opportunities in the law firms, and to start an academic career instead. The effect of the total number of judges

disappears once we control for the size of the student cohort (model 2). The effect of GNP goes down to about a third of its previous size, but remains significant (models 4). The effect of the number of judges in model 1 partly picks up the effect of student cohorts, suggesting a correlation the causes of which we could only speculate about. The higher GNP, the more habilitations occur 8 years later, as shown in model 3. The remaining effect of GNP in model 4 could reflect the expectation of future law professors that a more prosperous country will continue the expansion of the university system.

	model 1	model 2	model 3	model 4
time trend	-1.820*	-2.469***	-6.361***	-5.029***
# judges	9.026**	-1.901		
GNP			447.808***	162.010*
student cohort		1.767***		1.520***
lag8	-.258^{+}	-.358***	-.557**	-.404***
cons	-41.831^{+}	86.836***	-31.221*	40.544**
N	42	42	42	42
p model	<.001	<.001	<.001	<.001
R^2	.3645	.7782	.3997	.7944

Table 5
Adding Measures for Alternative Career Options
depvar: # habilitations in year x, robust standard errors
time trend is 0 in 1960, and grows by 1 every year
student cohort is # of newly inscribed students in all German universities, 20 years ago
judges 8 years ago
GNP eight years ago, in % of GNP 2009
*** p <.001, ** p < .01, * p < .05, $^{+}$ p < .1

e) Robustness of Our Preferred Model

The previous analysis indicates that a model controlling for the time trend and the student cohort twenty years ago, plus an autocorrelation term with a lag of 8 years, best explains our data. This fully supports our hypothesis. Since, in this model, the lag is highly significant, and substantially negative, this suggests that there is indeed a hog cycle, triggered by perceived job opportunities at the moment when the future professor and her supervisor decide to have her prepare for entering the market. We now undertake a number of robustness checks to corroborate our result.

As we have discussed near the end of Section 2 and illustrated in Figure 2, our dependent variable reacted positively to two strong exogenous shocks in the early 1970s and 2000s. If our hypothesis holds true, promising young lawyers should not only be influenced in their decision to prepare for an academic career if they observe such salient shocks. As a first robustness check, we thus control for the effect these two shocks have had *per se* (apart from their ability to trigger a cycle). Model 3 below enriches our model with dummy variables that neutralise the two peaks

exhibited by our data in Figure 2.[18] These additional control variables are indeed significant, but they do not affect our variable of interest, the 8year lag.

As another check of robustness, we examine a partial autocorrelation plot. Since we already know that there is a time trend and that we must control for the size of student cohorts, we do not base this plot on the raw data, but on the residuals from a regression that controls for these two variables (but of course not for the 8 year time trend). Partial correlations measure the correlation of the 8 year lag and now, after the effect of all shorter lags has been partialled out. As one sees, the negative correlation with the number of habilitations 8 years ago indeed stands out, Figure 11.

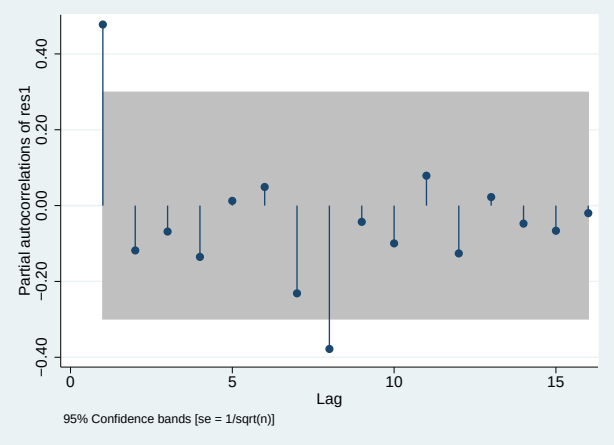

Figure 11
Partial Autocorrelation of Residuals

from OLS of # of habilitations in year t, controlling for # of new students in t-20 and the time trend

Figure 11 suggests that, additionally, there is positive autocorrelation with the year before. This is plausible. Habilitation procedure is complicated. Candidates starting in the same year may not all be able to finish their second book at the same moment, and some faculties are better organised than others when it comes to organising the formal procedure.

As a first robustness check, we therefore estimate a model with an additional autocorrelation term for the one year lag, Table 6 Model 2. The additional lag is indeed significant, but adding this additional control variable does not affect the significance or the size of the negative 8year lag.

In our preferred model, we use the time trend for detrending the data, since results then are more intuitive. In the time series literature, detrending is typically done through first differencing. If we use this procedure, we again support the significant negative 8year lag, Model 4.

A model with an autocorrelation term assumes that the effect of a past shock only gradually fades away. Our explanation for the significance of the one year lag would also fit a model with

18 The second peak did not occur in a single year. We use a dummy for the first year in which the number of habilitations was close to the maximum. If we tag another year during that peak, results do not change.

a moving average term, which is assumed to become immaterial after the period affected is over. Model 5 shows that the moving average term is indeed positive and significant, and that, in this model, the p-value for the 8year lag is even smaller.[19]

Finally, in Model 6, in the spirit of the Arrelano Bond model, we instrument the 8year lag by the 10year lag that our earlier results show to be clearly uncorrelated with the dependent variable, i.e. with the number of habilitations today (after controlling for the time trend and the size of the relevant student cohort).[20] This way we guard against the possibility that omitted variables make our estimation of the 8year lag inconsistent. Although in this model we only have the correlation between our instrument and the 8year lag for explanation, the effect of the 8year lag still is highly significant.[21]

Summing these additional tests up, we find that our main result, the 8 year lag, is very robust to changes in the specification of the statistical model.

	model 1	model 2	model 3	model 4	model 5	model 6
depvar	# habil	# habil	# habil	D# habil	# habil	# habil
time trend	-2.772***	-1.740*	-1.252**		-2.434***	-3.044***
student cohort	1.659***	1.066**	.829**	.194**	1.468***	1.744***
lag1habil		.352*	.421**	-.346***		
lag8habil	-.335***	-.303**	-.244**	-.238**	-.594***	
year1970			27.089***	32.770***	21.249*	17.420*
year1998			7.783**	7.715**	1.391	7.082
ma(1)					.380	
lag8habil, instrumented by lag10habil						-.293**
cons	68.087***	46.003**	35.648***	14.993**	53.790***	71.142***
N	42	42	42	42	42	42
p model	<.001	<.001	<.001	<.001	<.001	<.001
R^2	.7738	.8095	.8636	.5459		.8479

Table 6
Robustness Checks for Preferred Model
depvar: # habilitations in year x, robust standard errors
time trend is 0 in 1960, and grows by 1 every year
student cohort is # of newly inscribed students in all German universities, 20 years ago
year1970 is a dummy that is 1 for habilitations in 1970
year1998 is a dummy that is 1 for habilitations in 1998
ma(1) is a moving average term, of length 1 year
*** p <.001, ** p < .01, * p < .05

19 Since we want to jointly estimate a moving average term and an autocorrelation term, in this model we represent the autocorrelation by the lag in residuals, not in the dependent variable, i.e. we use Stata command arima. Deeper moving average terms are insignificant.

20 We are grateful to Jonathan Klick for suggesting this robustness check.
Since we only have one time series, there is no need for removing a fixed effect, by way of first differencing.

21 It remains significant, if we add the 11year lag as an additional instrument.

6. Conclusions

The market for law professors fulfils the conditions for a cobweb: Preparation for an academic career in law takes many years. Therefore supply cannot swiftly adapt to changes in demand. The (German) law faculties are hesitant to hire candidates who have been on the market for more than a small number of years. The faculties tend to read this as a signal that something must be wrong with this candidate. Therefore future law professors are a perishable commodity. Finally, the (German) law faculties live off public funds and must pay salaries that are fixed by statute. The faculties are therefore unable to respond to excess supply by hiring more professors. Theory does therefore predict a hog cycle. When there have been too little law professors in the past, there is too much supply today. When there have been too many law professors in the past, there is too little supply today.

In this paper we exploit the fact that, in the German university system, future law professors must formally qualify for the academic market by passing habilitation. The decision to grant habilitation is taken by the faculty of origin, which is prevented from hiring its own candidates. We therefore are in a position to precisely quantify the supply of candidates for all the years since 1960. We find significant autocorrelation, but time lags are implausibly deep. This changes if we control for the overall time trend, and for the size of student cohorts. Figure 12 summarises our results. A mere time series model (left panel) has a relatively poor fit, despite the fact that the lag of 15 years is highly significant. By contrast, the model controlling for the overall time trend and the size of student cohorts, with autocorrelation of 8 years (right panel), visibly has an excellent fit.

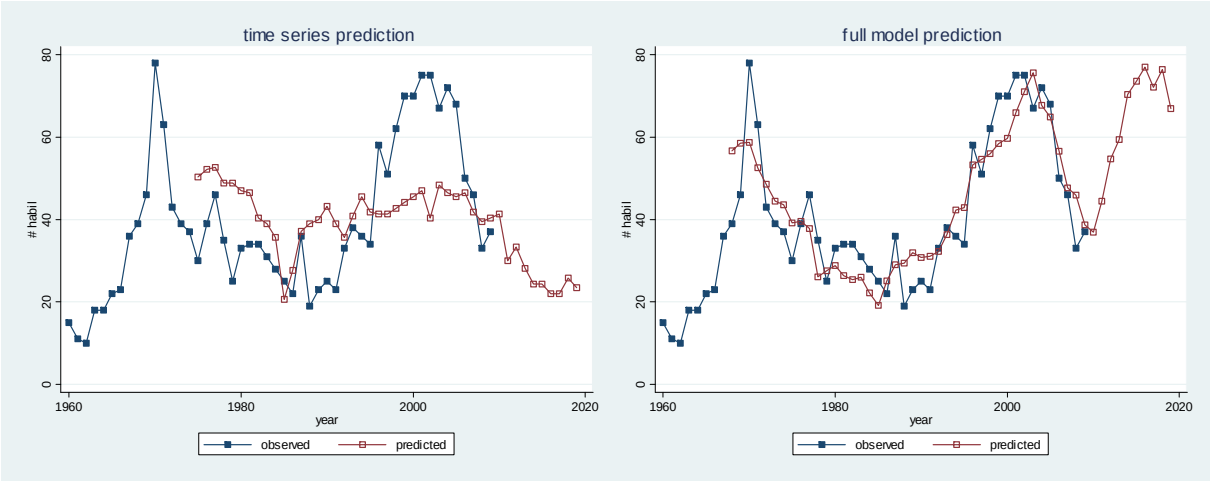

Figure 12
Out of Sample Predictions

Figure 12 serves a further purpose. We can use either model to make out of sample predictions for the next 10 years. Given our findings, one should not trust predictions from the mere time series, but should also take student cohorts into account, and should control for the time trend. Student cohorts of those researchers applying for open positions at the law faculties between

2010 in 2020 are already known. Using this information, our model predicts another steep increase until 2018, with some 85 candidates.

Shall we use this information to repeat the advice Fritz Baade and Hermann Abeking gave hog farmers in the 30s of the previous century (Baade and Abeking 1930)? They urged them to adopt an anti-cyclical investment policy. In our case this would mean that promising young lawyers, and their supervisors for that matter, should be hesitant to (invite them to) embark on an academic career. If our regression has it right, when these lawyers are ripe for the market of professors, good candidates will be in excess supply. There are two reasons why our advice has to be more cautious, though. It is not clear how fast and how profoundly the demand side of this market is changing. Finance ministers may be forced, after the financial crisis, to cut back on all public expenses, university education included. Law faculties may be forced to react to severe cuts by structural reforms. Such reforms are likely to privilege cheaper new candidates over the promotion of more established professors.

Moreover, an anti-cyclical reaction is only individually beneficial if most others behave cyclically. Theoretically, the resulting problem is well understood. It is known in game theory as the beauty contest, following John Maynard Keynes' famous likening the stock market "to those newspaper competitions in which the competitors have to pick out the six prettiest faces from a hundred photographs, the prize being awarded to the competitor whose choice most nearly corresponds to the average preferences of the competitors as a whole" (Keynes 1936:156).

Keynes anticipated what later got generalized as the theory of level-k-reasoning (Nagel 1995; Stahl and Wilson 1995). It considers self-referential decision processes, where decision outcomes depend on the expected decisions of others in the same situation, and assumes that players determine best replies to each other's behaviour by reasoning iteratively. For instance, let a simpleton with no regard for fellow players' strategies be defined as a level 0 player, then any player who anticipates and reacts to level-0-reasoning would inhabit level 1. Even more sophisticated strategists would ascend to level 2 by anticipating level-1-reasoning, and so on. In its general form, any level-k-strategy assumes that all other players use reasoning levels between 0 and (k-1). Empirical research suggests that most people only use a degenerate version of this iterated best reply mechanism, with level-1 and level-2 being most prominent (for a comprehensive survey see Bosch-Domenech, Montalvo et al. 2002).

While this literature suggests that the prevoyance of most people is rather limited, is it plausible to assume that the large majority of future law professors, and of their supervisors, is not prevoyant at all? Probably not, as the studies mentioned above even found a remarkable proportion of people adopting level-∞-reasoning, depending on their respective training, time availability, effort and judgment confidence. On the other hand, for future law professors the problem is exacerbated by the fact that they must predict a market some eight years ahead. Therefore the strategic uncertainty inherent in the beauty contest is compounded by the stochastic uncertainty inherent in all sorts of changes that may happen in the meantime. We must therefore leave young

lawyers considering an academic career with a problem of judgement: If they want to rely on our findings, they must also estimate how many of their potential competitors will try to second-guess the market at the moment when they expect to enter it. Ultimately, the traditional piece of advice will remain best: only prepare for an academic career in law if your advisor truly believes in you, and if you prefer a life driven by academic curiosity over the alternative options for a good lawyer.

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