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## Working Paper

# Does the data support the neo-mercantilist preoccupation with protecting manufacturing?

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## Does the Data Support the Neo-Mercantilist Preoccupation with Protecting Manufacturing?

by

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## Abstract

This paper explores the relationship between manufacturing and growth rate in recent years. We undertake a simple cross-country analysis using UN data. When controlling for variables relevant to growth, we find no significant relationship between the two variables. We argue that manufacturing protectionism cannot be rationalized by the data for this time period. Then, we look at developed countries like the United States and find that whereas a positive relationship between 10 year forward GDP growth and manufacturing was likely present in the 1970's, the same relationship does not hold today. Our findings shed light on recent debates over protectionism.

JEL classification: O24, O25, F13, O43

## Introduction

“Emotional arguments over protectionism today harken back to the second half of the eighteenth century, when Physiocracy, the philosophy that ‘only the farmer really made something out of more or less nothing’ was popular. The Physiocrats thus reasoned that manufacturing was unlikely to benefit an economy. Similarly, today, our gut reaction to the closing down of a factory is that we are allowing a central part of our economy to perish.” (Gopnik, 2010). Like the farms of the Physiocrats, manufacturing is a tangible symbol of a country’s prosperity. We show in this paper that all of us need to be careful not to overstate its importance.

The Economist (2011) assessed that the belief in the importance of manufacturing, what some have named “manufacturing fetishism,” is so important that it hosted an online debate on the proposition: “This House Believes that an Economy Cannot Succeed Without A Big Manufacturing Base.” Cambridge University’s Ha-Joon Chang argued in favour of the proposition against Columbia’s Jagdish Bhagwati. Chang won the debate 76% to 24% according to the readers’ vote. In the process of the debate, the share of manufacturing fetishists fell from 80% to 76%. So while Bhagwati did not win the debate, he shrank the proportion of manufacturing fetishists. These numbers illustrate the sway of manufacturing fetishists.

There is an alternative way to pick the winner. 95 comments were submitted from the floor by readers after introductory remarks by the chief protagonists. 53 comments were submitted after the debate was over. We counted the votes implied in the comments. We dropped all but one comment when multiple comments were submitted by the same contributor, and we dropped comments that did not take a side. After the opening remarks, the vote was 44 for Chang and 35 for Bhagwati, with Chang winning by 66% to 44%. The comments submitted after the closing statements voted 13 for Chang and 16 for Bhagwati with Chang collecting 44% to Bhagwati’s 55%. Our assessments of these comments is admittedly subjective, but free of intentional bias. Sometimes a decision was hard to call, for example when a commenter remarked that for most countries manufacturing is essential but for some it is not. The discrepancy between the two ways of measuring who won leads us to conclude that the contributors who evaluated the debate carefully enough to comment were less pro manufacturing than those voters who just reflexly clicked the “vote yes” or “vote no” buttons on their computer screens.

At its simplest level, the modern-day protectionist argument assumes that manufacturing is central to an economy. Hence, the logic goes, capital goods and knowledge accumulation in manufacturing is a tried and true recipe for growth. Moreover, concerns over structural unemployment and national security are used to argue that countries must keep manufacturing within their borders, and prevent offshore outsourcing.

In Part 1 of this paper, we seek to address the simple and crucial assumption that manufacturing value added share of gross domestic product (GDP) propels economic growth. Our motivation for addressing this assumption is that it is often used as a justification for protectionist measures such as tariffs and subsidies, which cause costly economic distortions. This part is an attempt to rationalize the protectionist assumption with cross-country empirical data.

In Part 2 of this paper, we limit our study to the most developed economies and examine the relationship over time that share of labour in manufacturing has on future economic growth. We will show that care should be taken not to overstate the desirability of a high manufacturing share for the economies of developed countries, especially in today's globalized economy.

In Part 3 we ask whether greater government effectiveness raises the share of manufacturing in GNP. We find an economically strong and statistically significant positive relationship. Thus, we conclude that manufacturing can be promoted by either protectionism or better governance. The choice? Better governance raises economic efficiency while protectionism lowers it.

## **1. Does Manufacturing Share of GDP Propel Economic Growth?: A Sample of All countries**

In this part, we use crossplots and two econometric models to analyse the relationship between manufacturing share of GDP and average growth rate of per capita GDP. We find that there is no conclusive evidence to support the claim that manufacturing enhances growth and therefore is crucial to an economy.

### **1.1 Data**

#### **Years Chosen**

We start our study with the year 1996, and study the impact of manufacturing share of GDP on the growth rate of per capita GDP between the years of 1996 and 2009. We chose 1996 because that was the earliest date for which the World Bank publishes its world governance indicator “government effectiveness,” which plays an important role as a variable in our model. For robustness, we also investigate the year 1998, which was the second year for which data was published.

#### **Manufacturing Data**

Our manufacturing data comes from the United Nations National Accounts Aggregates database (UNNAAD). The UNNAAD divides a country's GDP into various categories, one of which is called Manufacturing ISIC D, which is what we use. The dataset has fewer missing records than the other manufacturing dataset available. The dataset covers

the time period from 1970 to 2009. It includes GDP components data from all 216 UN member countries.

The UNNAAD defines manufacturing as any process that transforms raw materials into new products. It should be noted however, that the classification of economic activities based on this definition can be ambiguous, and can lead to somewhat arbitrary distinctions between what is deemed a manufacturing activity or not. For example, activities like tyre retreading and wood preserving are included in the ISIC D, whereas the breakdown of bulk raw materials and subsequent bottling and packaging thereof is not included in the ISIC D (United Nations Statistics Division, 2011).

When using this data, it is also important to acknowledge that many manufacturing companies either contract out services or have “evolved” into service providers. For example, Neely’s (2011) found that roughly 30% of firms studied provided both manufacturing and services. Only about 2% were pure manufacturing firms. An example of this trend is IBM, which was once a manufacturing firm, but reinvented itself as a service firm. “Servitisation” might obscure our analysis because it is more prevalent in developed countries, and therefore represents a potential systematic bias in our dataset.

### **GDP data**

Our GDP data also comes from the United Nations National Account Aggregates database. We selected a GDP dataset from the same source because we assume that any systematic biases in calculating GDP will also be prevalent in the data for Manufacturing ISIC D, so our calculations of the share of GDP that manufacturing represents will be as accurate as possible. The GDP data covers a time period between 1970 and 2009, for the same countries as the Manufacturing ISIC D data. Both manufacturing output and GDP are specified in current US dollars.

### **Governance data**

We use the World Bank’s (January 2011) government effectiveness point estimator for our governance variable. This is a composite of perceptions of various aspects of governance: “the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government’s commitment to such policies” (World Bank, January 2011, p.5). The estimator is calculated from surveys of thousands of informed stakeholders, including policy experts, households, firms, and NGOs. We use this variable as a proxy for judicious policymaking that contributes to growth.

### **Other data**

Additionally, we use two indicators from the World Bank’s World Development Indicators dataset: population and percent of labour force with secondary education. The WDI population data is complete for all members of the United Nations. The percent of labour force with secondary education indicator was chosen because we needed a proxy for human capital in our growth model.

### **Omitted Values**

Some of our data sets suffer from omitted values for certain countries. We are concerned that the missing values could be systematic (e.g. data could be missing for poorer or more volatile countries, thus skewing our results). For this reason, we decided to investigate two models, one for which few values were missing (Model I), and one for which more values were missing (Model II). In Model II, we make the trade off between relevant explanatory variables and observations.

## 1.2 Analysis

### Simple Regressions

We perform a simple regression of average geometric per capita growth rate from 1996-2009 inclusive on the manufacturing share of GDP in 1996. These are annualized growth rates. They are calculated as:

Per capita growth rate =  $\{[2009 \text{ per capita GDP}]/[1996 \text{ per capita GDP}]\}^{1/(2009-1996)}$

$$\text{per capita growth rate} = \left( \frac{2009 \text{ per capita GDP}}{1996 \text{ per capita GDP}} \right)^{\frac{1}{2009-1996}}$$

To convert to growth rates of real GDP per capita one must subtract the geometric average inflation over the period. This figure is 2.18% per year.

The formula is

$$\text{Real per capita GDP growth rate} = \left( \frac{\text{Nominal per capita GDP growth rate} - \text{inflation rate}}{1 + \text{inflation rate}} \right)^{\frac{1}{2009-1996}}$$

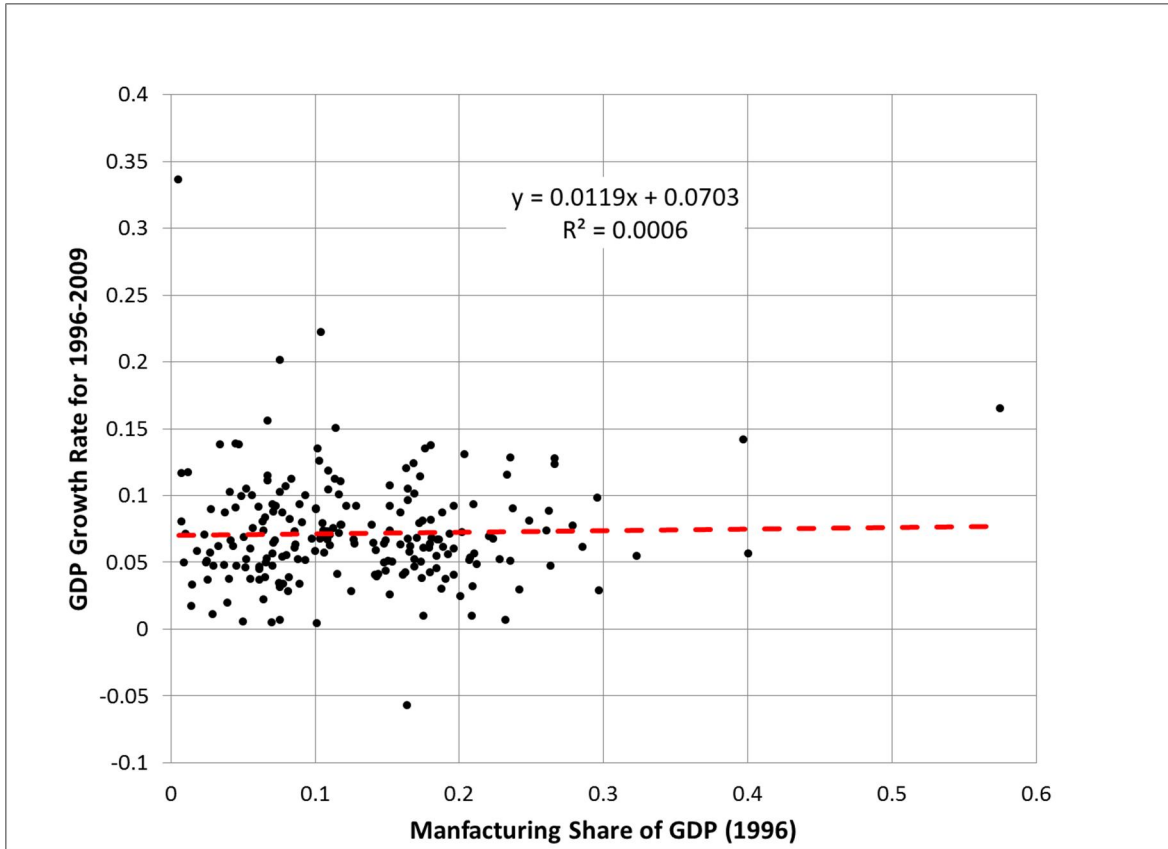
where growth rates and inflation rates are expressed as proportional change per year.

The regression is based on the results from 216 countries. We see in the chart below that the expected strong positive linear relationship between these two variables is not apparent. The regression p-value is .73, indicating that manufacturing share of GDP is not a significant explanatory variable for manufacturing share of 1996 GDP.<sup>1</sup>

**Figure 1. GDP Growth for 1996-2009 as explained by manufacturing share in GDP (1996)**

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<sup>1</sup> See Figure I of appendix for regression details. The appendix is available from Waite ([alecia.waite@duke.edu](mailto:alecia.waite@duke.edu)) upon request. The p-value is the probability of obtaining a test statistic at least as extreme as the one that was actually observed, assuming that the null hypothesis is true. The country with the highest growth rate (just under 35% per year) is Equatorial Guinea. This growth rate seemed too good to be true. We double checked this entry with an additional data source and it is correct.

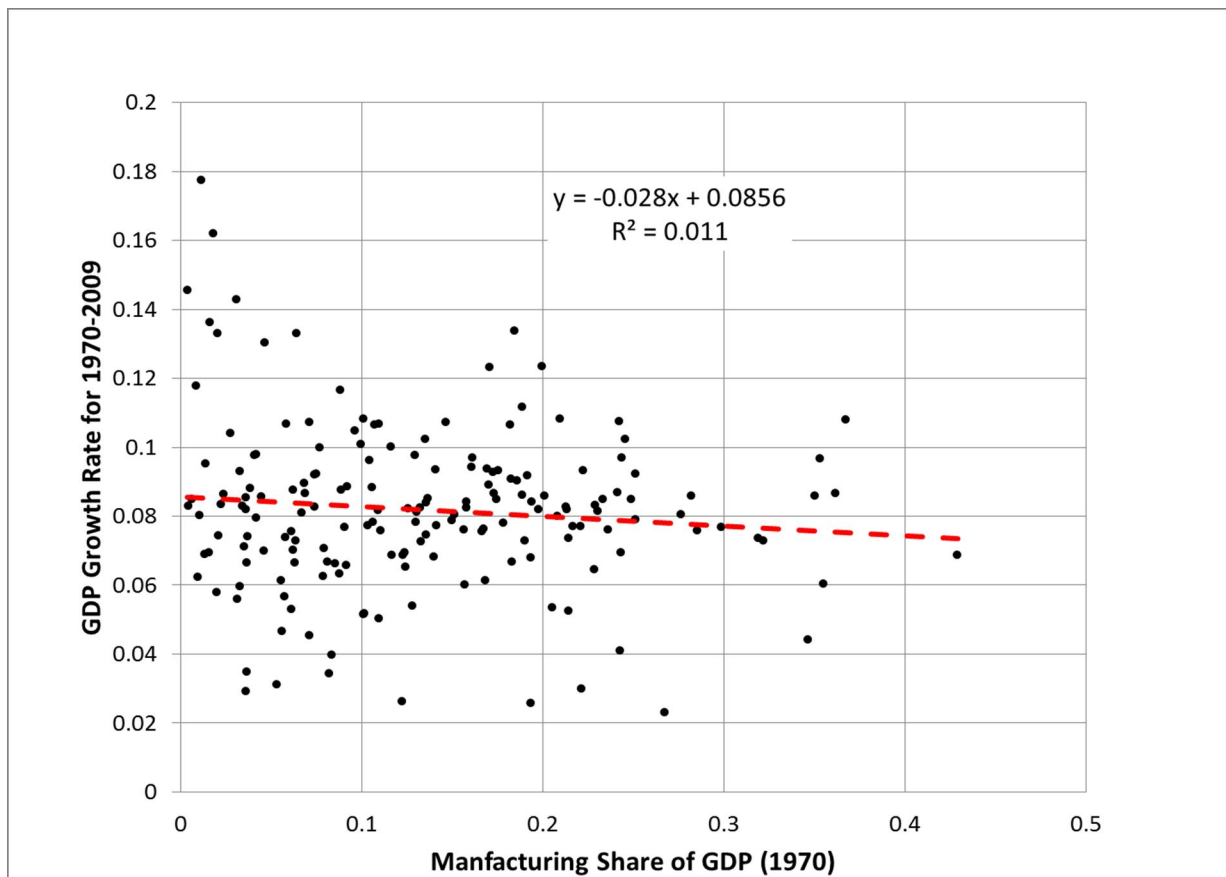


The advantage of a simple “uncontrolled” regression is that, because we are not tied down by availability of governance data (which starts in 1996), we can perform this analysis for a longer time interval. We construct a cross plot of average geometric per capita GDP growth rate for the years 1970-2009 below, with a similar conclusion, except here manufacturing share negatively affects the estimated growth rate,<sup>2</sup> (see Figure 2).

**Figure 2. GDP growth for 1979-2009 as explained by manufacturing share in GDP (1970)**

<sup>2</sup> See Figure II of appendix for regression details.





### Model I: three independent variables

In Model I, we control for level of development and governance:

$$growth = \beta_1 manshare + \beta_2 \ln(gdp) + \beta_3 gov't + \varepsilon$$

Where:

- **growth** is the compound annual growth rate of per capita GDP for the country for the years from 1996-2009
- **manshare** is the manufacturing value added share of the country's total GDP in 1996
- **gov't** is the World Bank's governance effectiveness point estimator
- **ln(gdp)** is the logarithm of the UN's per capita GDP in current USD in the initial year. We included **ln(gdp)** to account for possible convergence effects. Additionally, when we control for **ln(gdp)** we acknowledge that manufacturing's effect on growth rate may depend on level of economic development.

The regression is based on the results from 146 countries. Countries were excluded from the regression if their values were missing from either the United Nations' or the World Bank's databases for these variables.<sup>3</sup>

<sup>3</sup> There is a high probability of systematic exclusion. Many of the countries for which we lack government effectiveness data are developing countries.

When we analyze the effects of manufacturing value added share of GDP in 1996 on the average geometric growth rate, we see that when we control for per capita GDP in 1996 and for government effectiveness, we have a statistically insignificant beta coefficient on manufacturing value added share of GDP (p value of .79).<sup>4</sup> Furthermore, the magnitude of the coefficient is a mere .0125, which indicates that if *manshare* does affect growth, it does so in a very small way. We find no conclusive evidence that manufacturing value added share of GDP in 1996 has a significantly positive effect on growth rate for the years 1996-2009.<sup>5</sup> We also run a robustness check using the same model with 1998 as our initial year, because 1998 was the second year for which our government effectiveness data was available. Since the p-value is .33, we find no significant relationship.<sup>6</sup>

A further robustness check uses 1996 as the starting year, but used the average of available years for all other variables. This approach has pros and cons. On the one hand, our result is not biased towards any one year. On the other hand, we can make less of a case for causation when we do this, because we are using observations from later years to explain growth rate over the entire period 1996-2009. Furthermore, years 1997 and 1999 are missing for our governance proxy, so that variable is biased towards later years. For this robustness check, we find no significant relationship.<sup>7</sup>

## Model II: five independent variables

It could be argued that more variables are necessary to explain growth. Growth is generally taken to be a function of investment in physical capital, investment in human capital, population growth rate, and other factors like governance. To investigate the merit of this argument, we use proxies for these from the World Bank dataset. Accordingly, our second model is:

$$growth = \beta_1 manshare + \beta_2 \ln(gdp) + \beta_3 gov't + \beta_4 educ + \beta_5 popgrowth + \varepsilon$$

Where:

- *educ* is the percent of labor force with secondary education
- *popgrowth* is the compound annual growth rate of population over the period

Adding two variables significantly decreases the number of observations we have, because values for these variables are missing for many countries. Furthermore, there could be systematic reasons why values exist for certain countries but not for others. For this reason, we must accept that our conclusions could be biased. Hence, Model I is likely more reliable than Model II. Nevertheless, it is reasonable to assume that any relationship between manufacturing and growth rate would hold if we controlled for these variables, since these variables are relevant to growth.

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<sup>4</sup> Note that since we are defining growth in terms of per capita GDP, we don't need to control for population.

<sup>5</sup> See Figure III3 of appendix for regression results.

<sup>6</sup> See Figure IV of appendix for regression results.

<sup>7</sup> See Figure V of appendix for regression results.

As with Model I, we tested Model II with 1996 and 1998 as our starting years as well as for an average of the years.<sup>8</sup> Our results varied, and only one model (1998) had a statistically significant beta on *manshare*. The 1998 and average models had a positive beta, and the 1996 model had a negative beta. Because the significance and betas clearly depend on the starting year we choose, we are hard-pressed to argue that *manshare* is crucial to an economy.

### Summary of estimated models

Year	Model	$\beta_1$	$\beta_1$ <i>p-val</i>	# Obs
1996	$growth = \beta_1 manshare + \beta_2 \ln(gdp) + \beta_3 gov't + \varepsilon$	0.012	0.787	150
1998	$growth = \beta_1 manshare + \beta_2 \ln(gdp) + \beta_3 gov't + \varepsilon$	0.040	0.363	189
Average	$growth = \beta_1 manshare + \beta_2 \ln(gdp) + \beta_3 gov't + \varepsilon$	0.013	0.732	202
1996	$growth = \beta_1 manshare + \beta_2 \ln(gdp) + \beta_3 gov't + \beta_4 educ + \beta_5 popgrowth + \varepsilon$	-0.083	0.161	47
1998	$growth = \beta_1 manshare + \beta_2 \ln(gdp) + \beta_3 gov't + \beta_4 educ + \beta_5 popgrowth + \varepsilon$	0.149	0.030	47
Average	$growth = \beta_1 manshare + \beta_2 \ln(gdp) + \beta_3 gov't + \beta_4 popgrowth + \varepsilon$	0.045	0.259	198

## 2. Does Manufacturing Share of GDP Propel Economic Growth?: A Sample of Developed Countries

In this part, we show that in 10 major developed countries, the relationship between manufacturing share of employment and forward per capita GDP growth rate<sup>9</sup> is no longer positive.<sup>10</sup> Tracking the correlation between the countries' 10 year forward per capita GDP growth rate and share of manufacturing in employment reveals that although having more of a workforce in manufacturing may have aided GDP growth in the past, we should be wary of claims that it does today.

### 2. 1 Data

<sup>8</sup> See Figures VI, VII and VIII of appendix for regression details.

<sup>9</sup> In order to diminish the impact of business cycle fluctuations, a 10 year forward geometric average per capita growth rate was chosen.

<sup>10</sup> Manufacturing share of employment data is from United States Department of Labor Bureau of Labor Statistics. Per capita GDP data is from the United Nations Statistics Division's National Accounts Main Aggregates database. Per capita GDP is measured in current USD.

Our manufacturing share of labour data comes from the United States Bureau of Labor Statistics' Annual Labor force statistics for the years 1970-2009. This particular data set only had data for ten developed countries, so we confine our analysis to these ten countries. The countries which we study are Australia, Canada, France, Germany, Italy, Japan, the Netherlands, Sweden, the United Kingdom, and the United States. We chose this data set because it was contained data for a relatively long period of time (compared with other available data sets), and had relatively few missing values: the data for the US is missing for year 1970 and for Sweden is missing for the years 1970-1973.

We take the GDP data again from the United Nations National Account Aggregates database. The GDP data covers a time period between 1970 and 2009. GDP is specified in 2009 US dollars. We chose this data set because it contains no missing values, whereas other GDP datasets had many missing values.

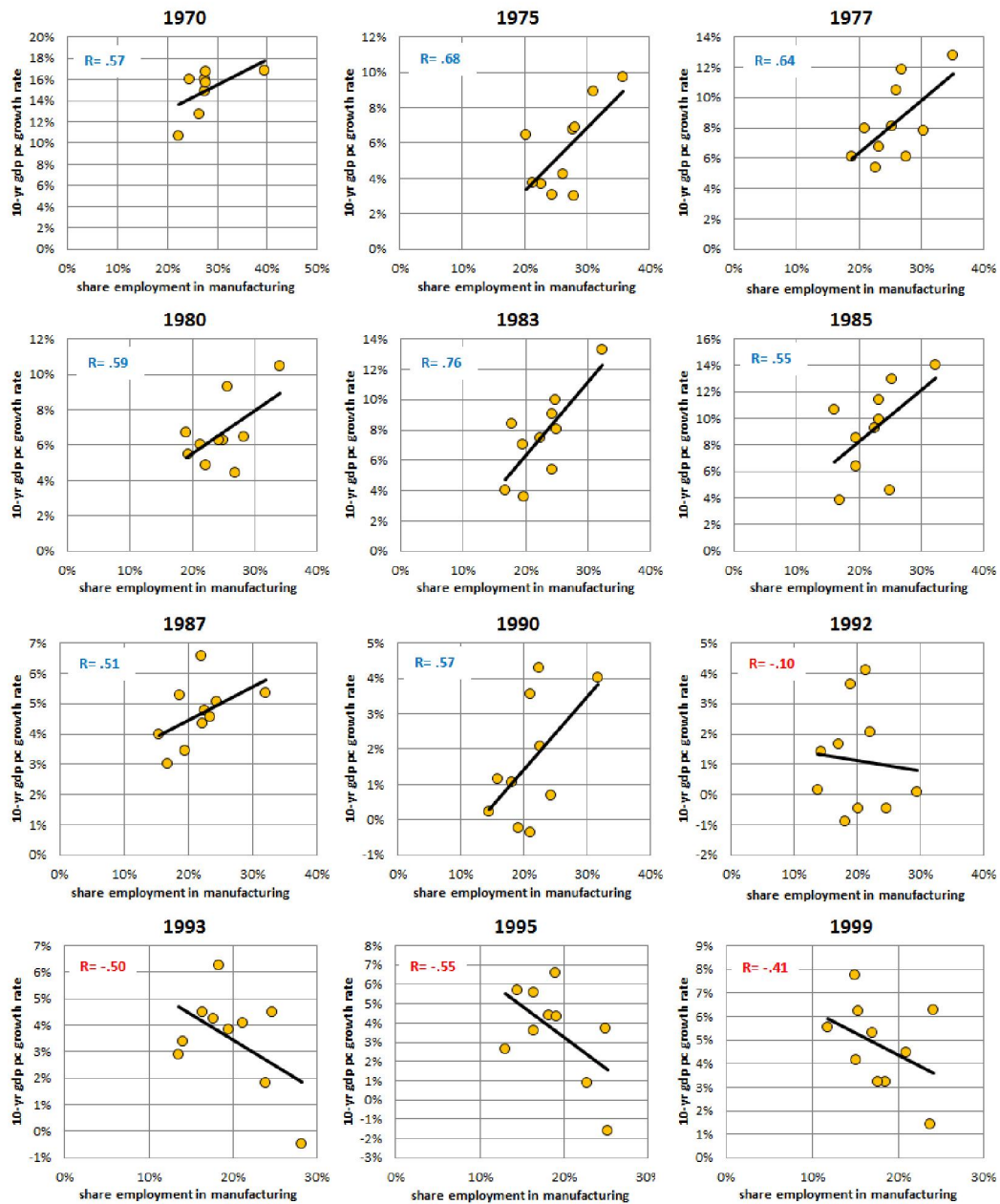
## 2.2 Analysis

For each country in our study, we calculated 10-year forward geometric growth rates for per capita GDP for each year from 1970 to 1999. The year 1999 was the most recent year for which 10-year growth rates could be calculated. Then for each year, a cross-country regression was performed by predicting the 10-year growth rate based on the manufacturing share of employment in the start of the 10-year period. Each regression contained 10 data pairs corresponding to the 10 countries in the study.<sup>11</sup>

### **Figure 3. Relationship between 10 year per capita forward growth rate and share of employment in manufacturing**

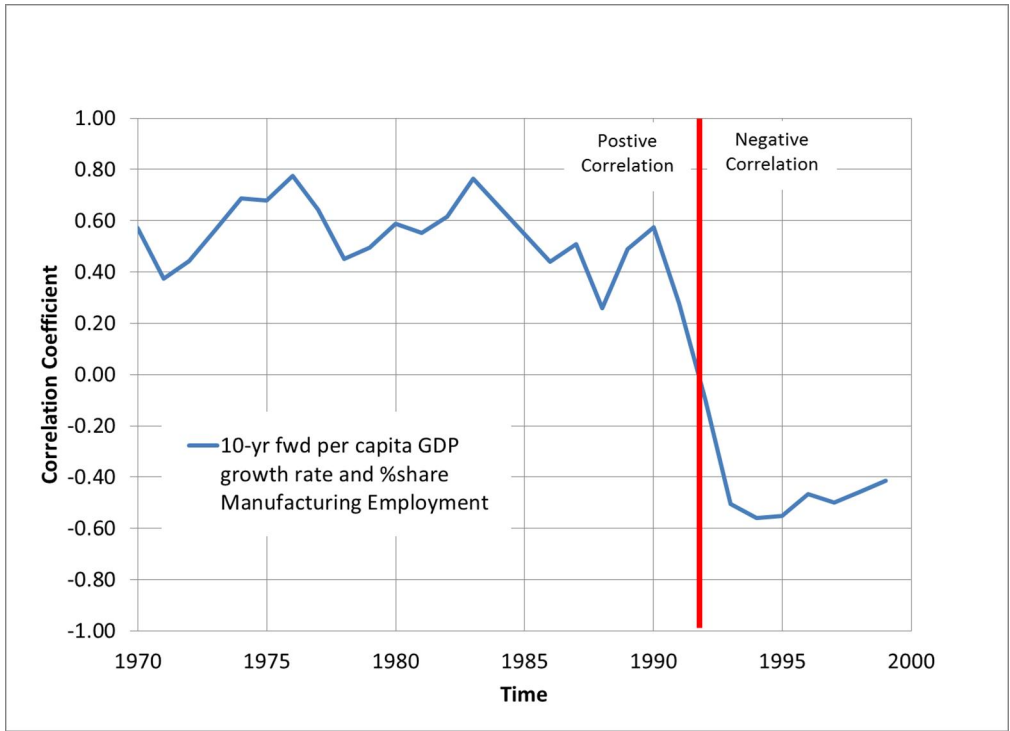
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<sup>11</sup> These countries were chosen because they are the ten countries for which the Bureau of Labor Statistics publishes labor force "country comparisons".



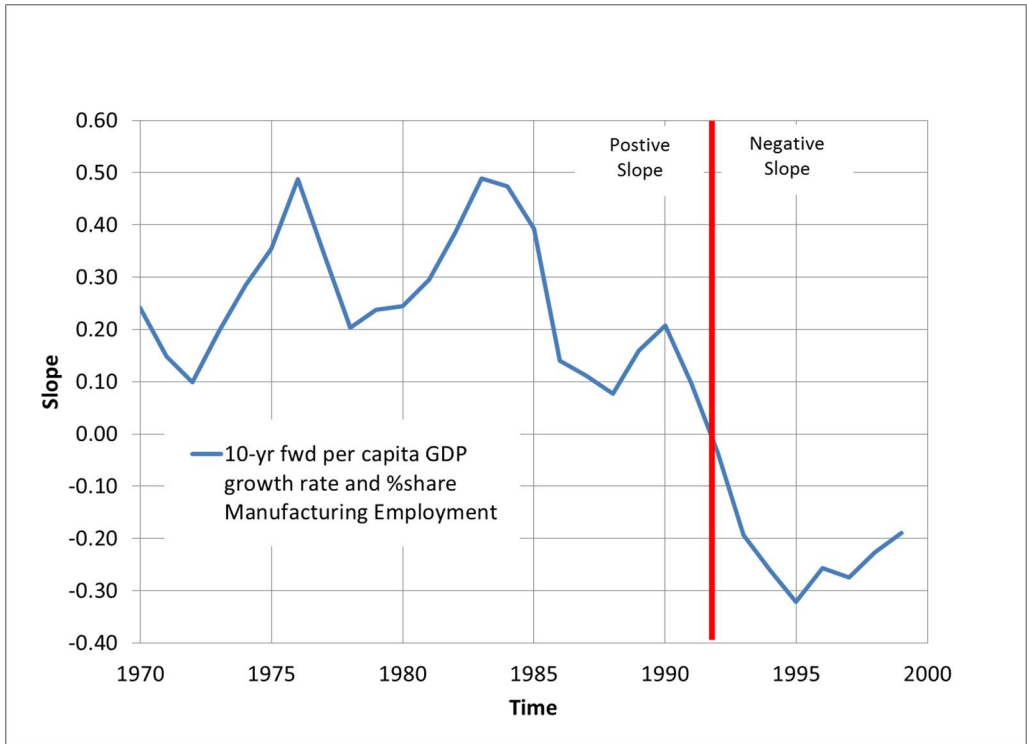
Regression slopes and correlations for each year between 1970 and 1999 were plotted over time, revealing an interesting temporal change in the cross-country relationship between share of labour in manufacturing and future per capita GDP growth.

**Figure 4. Cross-country correlation between per capita GDP growth and share of labour in manufacturing**



Whereas relatively strong positive correlations were observed in the 1970s and 1980s, the trend reverses and turns negative between 1991 and 1993. Out of these ten countries, the countries with more manufacturing share of employment (the US, Japan, Italy) grew more in the 1970s. But today, developed countries with more manufacturing share of employment grow less over ten years.

**Figure 5. Cross-country regression slope between per capita GDP growth and share of labour in manufacturing**

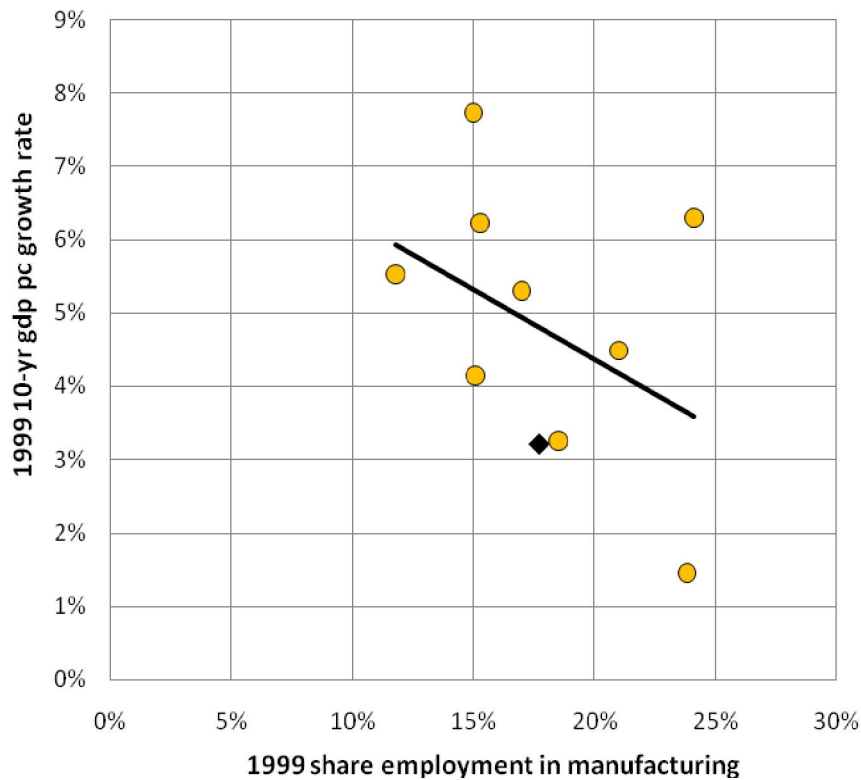


This has important implications for countries like the United States, where there is an ongoing debate over the value of protectionism in manufacturing to the economy. Politicians are reluctant to reduce trade barriers protecting the manufacturing sector for fear of economic troubles. Authors like Ian Fletcher (2009) tout “successful protectionism and industrial policy” as the road to economic prosperity.<sup>12</sup>

In figure 6, the black diamond represents the United States, whose share of employment in 1999 was 17.7%. The 10-year forward geometric per capita growth rate starting in 1999 was 3.22%. That it is below the trend line suggests that its ten year per capita average GDP growth rate was low for its share of manufacturing employment compared with the other 9 developed countries we studied.

**Figure 6. Zooming in on 1999**

<sup>12</sup> Not everybody agrees that such strategies would work for a country like the United States. Delong and Ripoll (2005) showed that for relatively richer countries, the relationship between high tariff barriers and economic growth is negative, but for relatively poorer countries, the relationship is positive. This implies that at a certain level of income, protectionist tariffs negatively affect growth.



### 3. Does Effective Governance Promote Manufacturing?

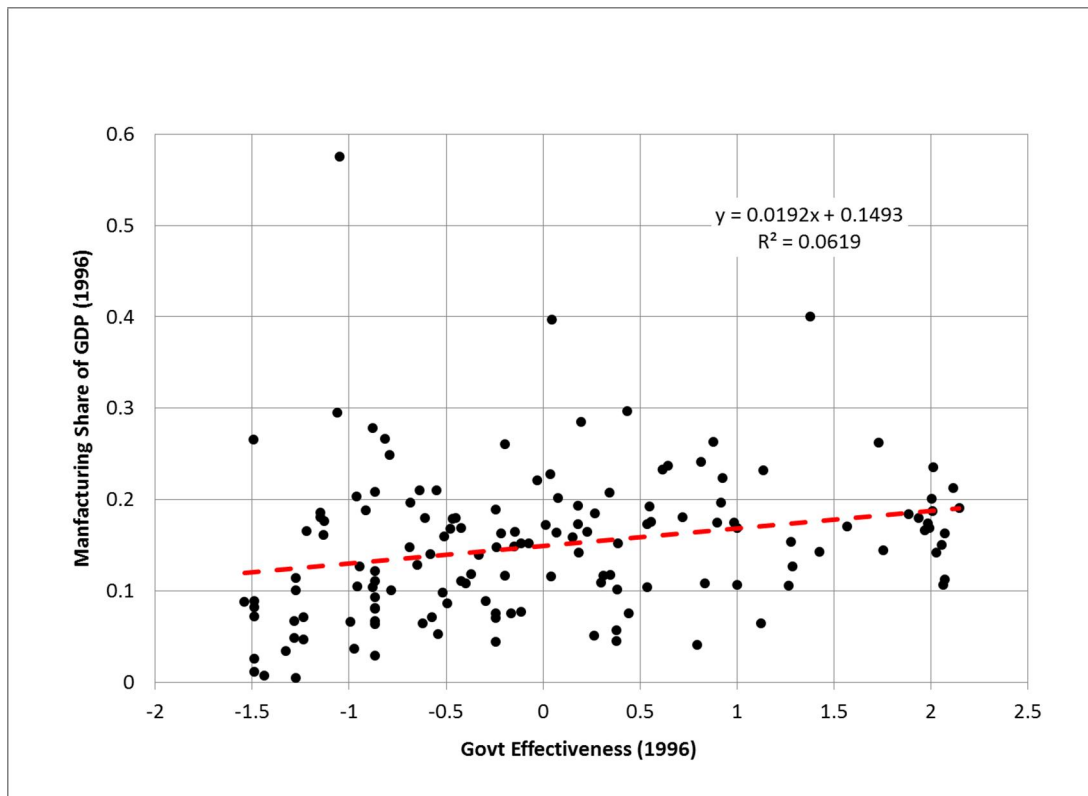
Our results raise two questions. First, has manufacturing been replaced by services in developed countries? If so, what are the implications? We urge more research to be done on this, to clarify what types of economic activity *are* relevant to economic growth. If manufacturing has been replaced by services, then what role does outsourcing play in this transition? What happens when developing countries have nobody to outsource their manufacturing to?

Second, what can be done to strengthen a country's manufacturing base? Preliminary analysis of government effectiveness on manufacturing value added share of GDP indicates that government effectiveness could be an important determinant of manufacturing value added share of GDP. It is likely that bad governance impinges on manufacturing more than services, since companies are scared to build up a capital stock that may be captured by crooks, so improving governance could help strengthen a manufacturing base (Grabowski and Mueller, 1972).

This can be seen through a very simple regression of our World Bank government effectiveness point estimator (from above) on manufacturing value added share of GDP in 1996. The relationship is visible in the following scatterplot of 146 countries:



**Figure 7. Manufacturing value-added share in GDP explained by government effectiveness (1996)**



Note how the very best governance (above 1.5) corresponds to a manufacturing value added share of GDP mostly greater than 10%, whereas the worst (below -1.25) corresponds to a manufacturing value added share of GDP mostly less than 10%. A regression of manufacturing value added share of GDP in 1996 on government effectiveness for 146 countries in 1996 was significant at the .5% level.<sup>13</sup> Note also that the regression line rises from a manufacturing share of 12% for the worst governed countries to 19% for the best governed ones.

#### **4. Some Reflections on The Economist’s Bhagwati-Chang Debate**

In closing we return to some of the issues raised in the Bhagwati-Chang debate on the importance of manufacturing. We looked for a plea for subsidies to manufacturing or for manufacturing protectionism through all 103 pages of the debate. No one made such a plea explicitly. However, we are not clear whether the pro forces are implicitly justifying subsidizing manufacturing. Moreover, Bhagwati refers to “the revival in the public domain of the view that therefore manufactures must be supported.”

He also makes the classic point:

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<sup>13</sup> See appendix Figure IX for regression details.

“.. if the returns to better technology accrue to the firm, there is no reason to subsidise: one needs to establish an externality to advocate a subsidy. (Bhagwati).”

We argue, furthermore, that even if subsidies are desirable to correct externality nothing should be subsidized until there is a consensus methodology of how to determine optimal subsidies. And the objective should be global welfare, not national welfare, with transfer payments handling the distribution of welfare between countries. All this is a preposterously tall order, especially since we can think of many interventions which do not even serve national welfare.

Sir Geoffrey Owen (London School of Economics) in his comment on the debate (as part of the interchange hosted by *The Economist* writes:

“There are plenty of things the government can do to improve the supply side of the economy, but trying to alter the balance between manufacturing and services is not one of them.”

He adds

“Past experience in Europe suggests that attempts by governments to alter the structure of their economies by favouring one sector over another generally cause more problems than they solve. The effect in many cases has been to preserve uncompetitive businesses, often at great cost to the taxpayer, and to slow down the redeployment of resources into areas where they can be put to better use.”

“Countries should specialize in what they are best at. One of the weaknesses in British industrial policy in the 1960s and 1970s was the reluctance to accept that Britain could not expect to compete against America in all the major high-technology industries; for example, a great deal of effort was wasted in trying to create a national champion in computers that could hold its own against IBM. Similarly, today many people envy Germany's manufacturing strength and look for ways of emulating it. But for a mixture of historical and institutional reasons Britain's competitive advantage lies in different areas, some of which are outside manufacturing—financial services, business and professional services, creative industries and the like.”

In one of our favorite articles, Paul Krugman (1993) writes:

“Now there are reasons, such as external economies, why a preference for some industries over others may be justified. But this would be true in a closed economy, too. Students need to understand that the growth of world trade provides no additional support for the proposition that our government should become an active friend to domestic industry.” (p. 124)

Finally, to the extent that a small share of manufacturing in an economy is a marker for business-hostile economic policies, we agree that a larger share of manufacturing predicts economic success. So in that sense one can vote for the proposition without being a manufacturing fetishist, just an efficiency fetishist.

## **5. Conclusion**

In Part 1, we saw that the protectionist assumption that manufacturing is crucial to an economy is not unambiguously supported by the data. Moreover, even when we control for various variables relative to growth, we find no definitive evidence for a relationship. In Part 2, we saw that the manufacturing sector is not as crucial to developed countries' per capita economic growth as it was in the 1970's and 1980's, and thus we need to be careful not to overstate the value of employment in manufacturing to a country's per capita GDP growth. Just as the role of agriculture in the French economy changed in the eighteenth century due to economic development, the role of manufacturing in developed economies today may be changing. In Part 3, we found that effective governance is positively related to a high manufacturing share. We interpret this as supporting the idea that effective governance creates an economy in which firms feel safe to build up their capital stocks, and this stimulates manufacturing relative to less capital intensive services.

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