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JEL classification: C10, E32, J21.

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October 15, 2009

Abstract

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1 Motivation

It is a well known fact that hiring and firing workers (i.e., the extensive margin of labor adjustment) is a lot more costly for continental European firms than for their U.S. counterparts, due to a more restrictive employment protection legislation (see, e.g., OECD (2004) for employment protection indices on various countries and World Bank (2008) for firing cost numbers). Against this background, it may be expected that continental European firms use the intensive margin a lot more (i.e., the number of hours per worker is more procyclical than in the United States) to accommodate business cycle fluctuations. A knowledge of the quantitative importance of the extensive vis-à-vis the intensive margin is both important for the appropriate design of business cycle models (while traditional business cycle models only include the intensive margin, many recent versions limit their attention to the extensive margin) and economic policy (concerning the effects of tax, labor market and other reforms[1]).

[1] Income taxes may for example have larger disincentive effects when the intensive margin plays an important role, as this may lead to a larger aggregate labor supply elasticity.

The seminal paper by Hansen (1985) discusses the relative importance of the extensive and the intensive margin in the United States. However, the employed data for the United States is somewhat outdated. There are some papers which analyze the importance of the extensive and the intensive margin in explaining the divergence in hours worked between Europe and the United States.[2] However, so far there is no comparative evidence for the relative importance of these two margins for business cycle dynamics in European countries and the United States.

We make a first attempt to fill this gap in the literature, by comparing the role of the extensive vis-à-vis the intensive margin in the United States and in Europe's largest economy, Germany. We find that the extensive margin continues to be dominant in the United States (as outlaid by Hansen (1985). Interestingly, the relative importance of the extensive versus the intensive margin is of similar magnitude in Germany and the United States.

2 Extensive vis-à-vis the Intensive Margin

2.1 Decomposition

Total hours, T, are the product of the hours per worker, H , and the number of workers, N ($T = HN$). By log-linearization, we obtain

$$\hat{t} = \hat{h} + \hat{n}. \tag{1}$$

This linear decomposition makes it possible to quantitatively assess the aggregate hours variability in terms of the separate contributions of the two margins. The variance of the total hours can be written as

$$\begin{aligned} var(\hat{t}) &= var(\hat{h}) + var(\hat{n}) + 2cov(\hat{h}, \hat{n}), & (2)\\ &= cov(\hat{t}, \hat{h}) + cov(\hat{t}, \hat{n}), & (3) \end{aligned}$$

since the covariance term gives the variability explained by variations in the respective margin, both directly and through its correlations.

While Hansen (1985) calculates the variation of hours per workers and employment divided by total hours, we follow Fujita and Ramey (2009) and make use of the covariance terms in equation (3). Thus, the proportion of the intensive margin of total variation is given by

$$\vartheta^{INT} = \frac{cov(\hat{t}, \hat{h})}{var(\hat{h})}. \tag{4}$$

Analogously, the proportion of the extensive margin of total variation is given by

$$\vartheta^{EXT} = \frac{cov(\hat{t}, \hat{n})}{var(\hat{h})}. \tag{5}$$

[2] See, for example, Langot and Quintero-Rojas (2008a, b) and Rogerson (2006). Note that all these papers use annual data for their analysis, while we employ quarterly data sets, which provide a better picture of the business cycle dynamics.

2.2 Empirical Results

Overlapping data for Germany and the United States is available from the first quarter of 1970 to the second quarter of 2009. As German data shows a break due to unification in 1990, we use two methods to make German and U.S. data comparable. First, we split the German and the U.S. sample in the time before and after unification (namely, before and after 1991[3]). Second, we synthetically combine the periods before and after unification for Germany. To avoid the structural break in the time series, we assume that there is no level-shift associated with the unification, i.e., we substract the initial jump in any consecutive period after 1990:Q4. We write all variables in logarithmic terms and detrend them with an Hodrick-Prescott filter with smoothing parameter, $\lambda = 100,000$. Further details on the data and its manipulation can be found in the Appendix.

	Germany (70-09)	USA (70-09)	Germany (70-90)	USA (70-90)	Germany (91-09)	USA (91-09)
Extensive	93.3%	85.4%	83.0%	87.6%	84.8%	82.5%
Intensive	6.7%	14.6%	17.0%	12.4%	15.2%	17.5%

Table 1: Extensive vs. intensive margin in Germany and the United States

Table 1 shows that the relative importance of the extensive vis-à-vis the intensive margin is similar in Germany (see Figure 1 for a visual inspection) and in the United States (see Figure 2 for a visual inspection). In all cases, the contribution of the extensive margin is larger than 80 percent. For robustness reasons, we also use a smoothing parameter (results are not shown here, but available on request), $\lambda = 1,600$. With this exercise, the extensive margin becomes somewhat more important in the United States than in Germany (e.g., 81 percent versus 85 percent for the entire sample period). However, it continues to hold that the extensive margin is the dominant force in both countries.

2.3 Implications

We can draw several interesting implications from our empirical exercise:

- Theoretical business cycle researchers should not omit the extensive margin in their business cycle frameworks, as it is the dominant mechanism in the labor market adjustment process both in Germany and the United States.

- Due to the overarching dominance of the extensive margin, it may be a plausible short-cut to exclusively use the extensive margin in theoretical business cycle models (see, e.g., Krause and Lubik (2007), and Blanchard and Galí (2009) for two recent contributions which use this short-cut). If both margins are integrated into theoretical models, the extensive margin must play the dominant role in response to shocks to be in line with the evidence.

- The surprising similarity in the relative importance of the extensive vis-à-vis the intensive margin in Germany and in the United States does not call for completely different labor market models for these two countries.[4]

[3] Data for unified Germany is only available from 1991.

[4] However, there may be other reasons which call for a different modeling approaches. Gartner et al. (2009) show for example that the job-finding rate, vacancies and the market tightness are a lot more volatile in Germany than in the United States.

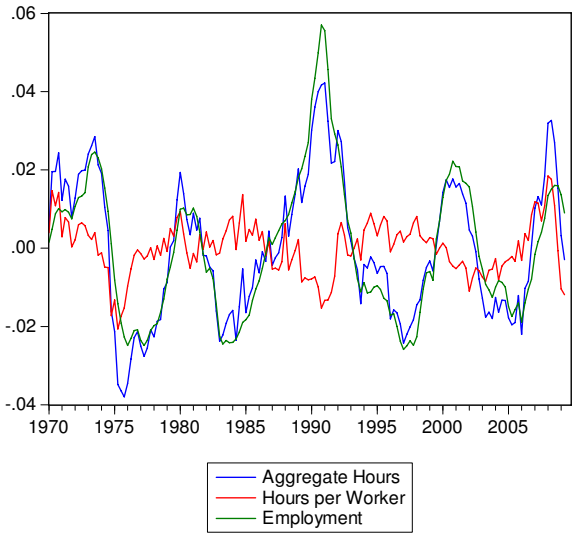

Figure 1: Extensive vs. intensive margin for Germany.

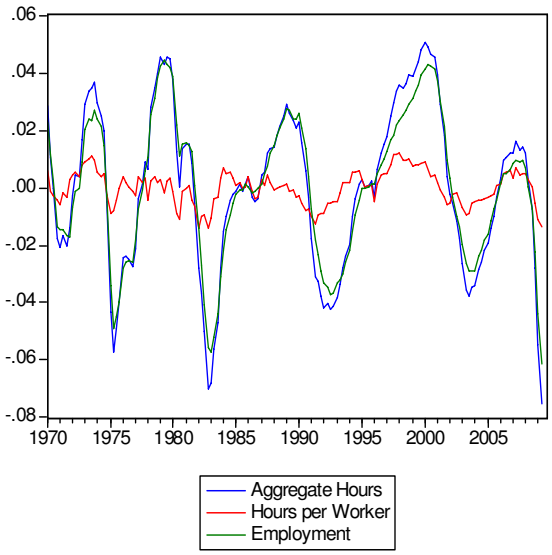

Figure 2: Extensive vs. intensive margin for the United States.

- Although the extensive margin in Germany is more regulated, it is not substantially less important than in the United States. This may be due to the regulation of the intensive margin, which makes it also very costly (e.g., due to limits on overtime hours or mandatory extra payments).

3 Conclusion

This paper presents empirical evidence for the relative importance of the extensive vis-à-vis the intensive margin of labor adjustment in Germany and the United States. We find that the extensive margin of labor adjustment is a lot more important than the intensive margin. This holds both for the United States and Germany, although the labor market structure in these two economies is very different.

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5 Appendix: Data Description

We use quarterly, seasonally adjusted[5] data from 1970:Q1 to 1990:Q4 for West-Germany and data from 1991:Q1 to 2009:Q2 for unified Germany. Time series for Germany are taken from the *German Federal Statistical Office*. For the United States, we use quarterly, seasonally adjusted data from 1970:Q1 to 2009:Q2 provided by the *Bureau of Labor Statistics*. We obtain the hours per worker and the number of employed workers from these data sources. This allows us to calculate the series of aggregate hours. All time series are written in logarithmic scale and are detrended, using a Hodrick-Prescott filter with the smoothing parameter, $\lambda = 100,000$.

[5] Seasonal adjustment is based on the multiplicative Census X12-ARIMA method.